NIDEK

AUTO REFRACTOMETER, AUTO REF/KERATOMETER

Model AR-360A, AR-330A, AR-310A, ARK-560A ARK-530A, ARK-510A

SERVICE MANUAL



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§1 INTRODUCTION

- This service manual is for the NIDEK AUTO REFRACTOMETER and AUTO REF/KERATOMETER models: AR-360A, AR-330A, AR-310A, ARK-560A, ARK-530A and ARK-510A.

- For correct service, thorough understanding of the contents of this manual is required prior to the service.

- Refer to the operator's manual and parts list for the AR-360A, AR-330A, AR-310A, ARK-560A, ARK-530A and ARK-510A.

- Refer to the Service Manual Annex for important changes.

- In case the device cannot be repaired according to the procedures described in this manual, please report the serial number of the device and details of the symptom or symptoms.

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§2 SAFETY PRECAUTIONS

<General precautions>

- Servicing should be performed by NIDEK service persons or other qualified personnel.
- Perform all servicing according to the procedures described in this manual.
 Failure to do so may cause unexpected accident or malfunction.
- When performing maintenance work, turn off the power switch and disconnect the power cord from the wall outlet unless the power needs to be on.
- Never wipe the covers by using an organic solvent such as paint thinner. Doing so may ruin the surface and damage the appearance of the device.
- Invisible laser (class 3B laser) is used. (* This device is classified to a Class 1 laser product and does not emit laser harmful to eyes.)

<Maintenance precautions>

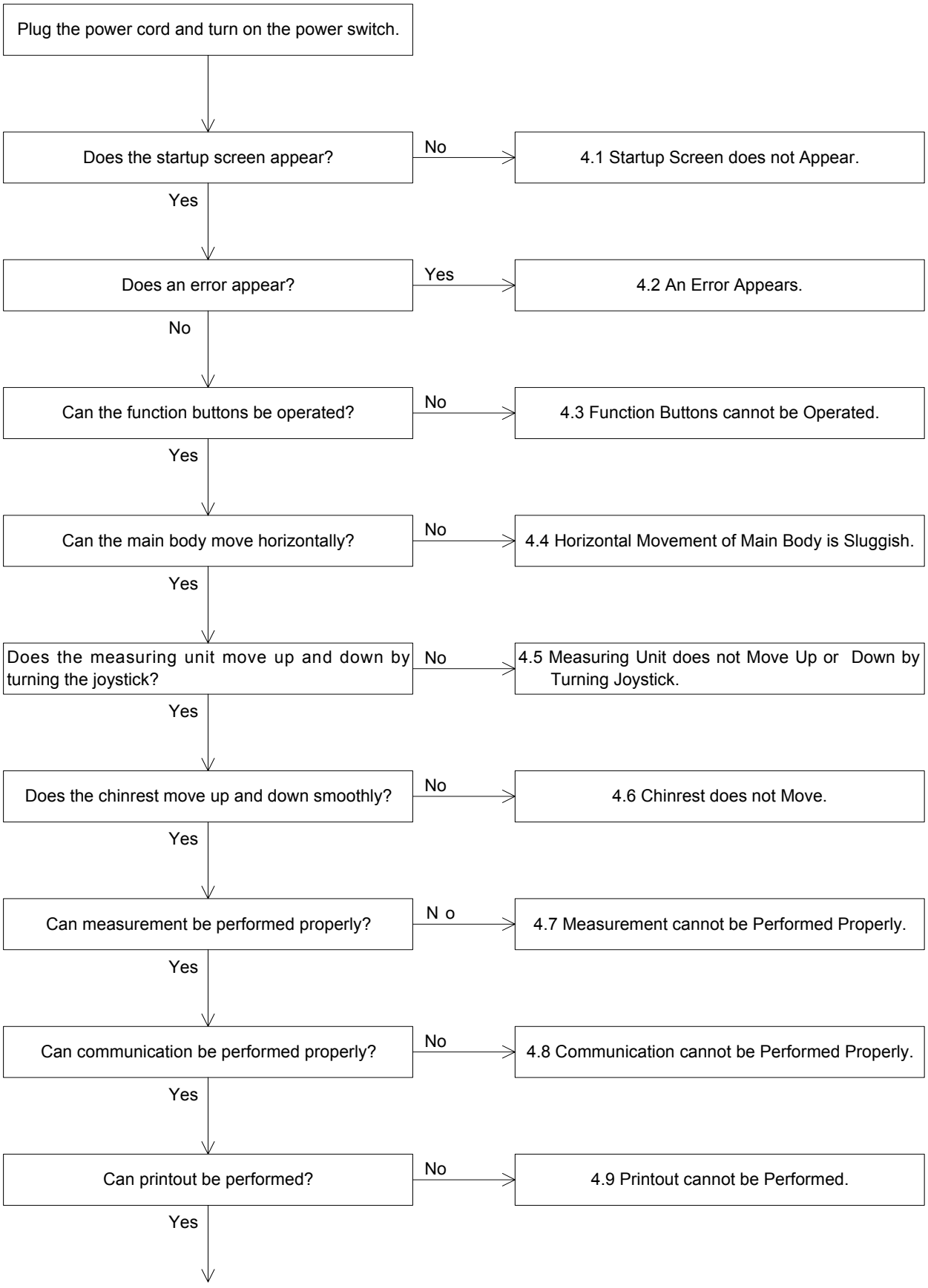
- Never look at the laser beam (invisible laser: class 3B) from the phototransmitter ASSY. directly or touch it.
- In case of system malfunction, check the symptom and turn the power switch off.
- Never drop parts or screws inside the system, nor bump it against surrounding objects.
- Prepare storage cases so as not to lose the removed screw or parts.
- Screw or unscrew the screws with proper tools.
- After loosening the screws fastened by a threadlocking adhesive, be sure to reapply the threadlocking adhesive to the screws when retightening them.
- After replacing parts, make sure that they are fixed securely before turning on the power .
- Should you observe strange odors or smoke being issued from the system, immediately turn off the power switch, disconnect the power cord from the outlet, and investigate the cause. If the system is powered in abnormal conditions, fire, electric shock, or total loss of the system may result.
- See “8.1 Wiring Diagram” and “8.2 Connector Cable” for checking cable breaks described in TROUBLESHOOTING. In addition, check cables for the following:
 (1) Connectors are connected and crimped securely.
 (2) No contact failure occurs after re-connection of connectors.
 (3) Cables are soldered properly.
 Do not yank the cables with excessive force. Doing so could cause cable breakage.
 Do not perform servicing with wet hands. Doing so could cause electric shock or malfunction.

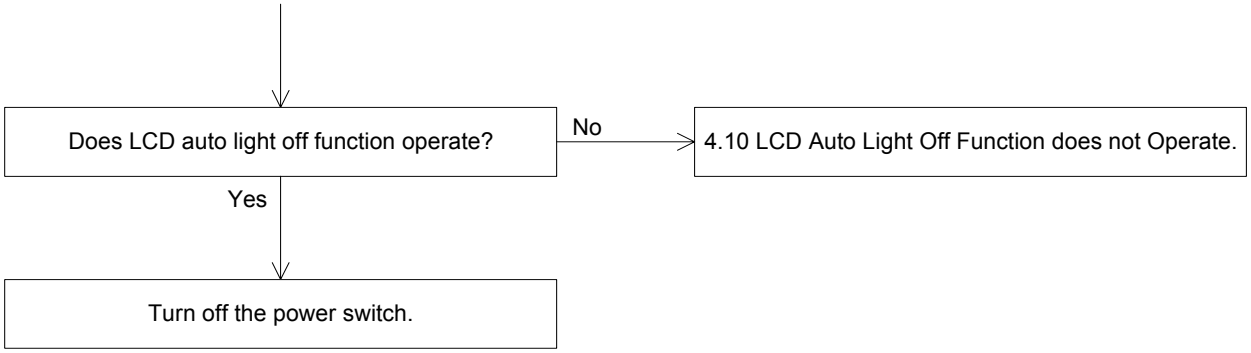
<Adjustment precautions>

- Perform adjustment on a vibration-free, level, and stable surface.
 A slanted floor or place subject to vibration will obstruct accurate adjustment.
- Do not use adjustment jigs for puropses other than those intended.

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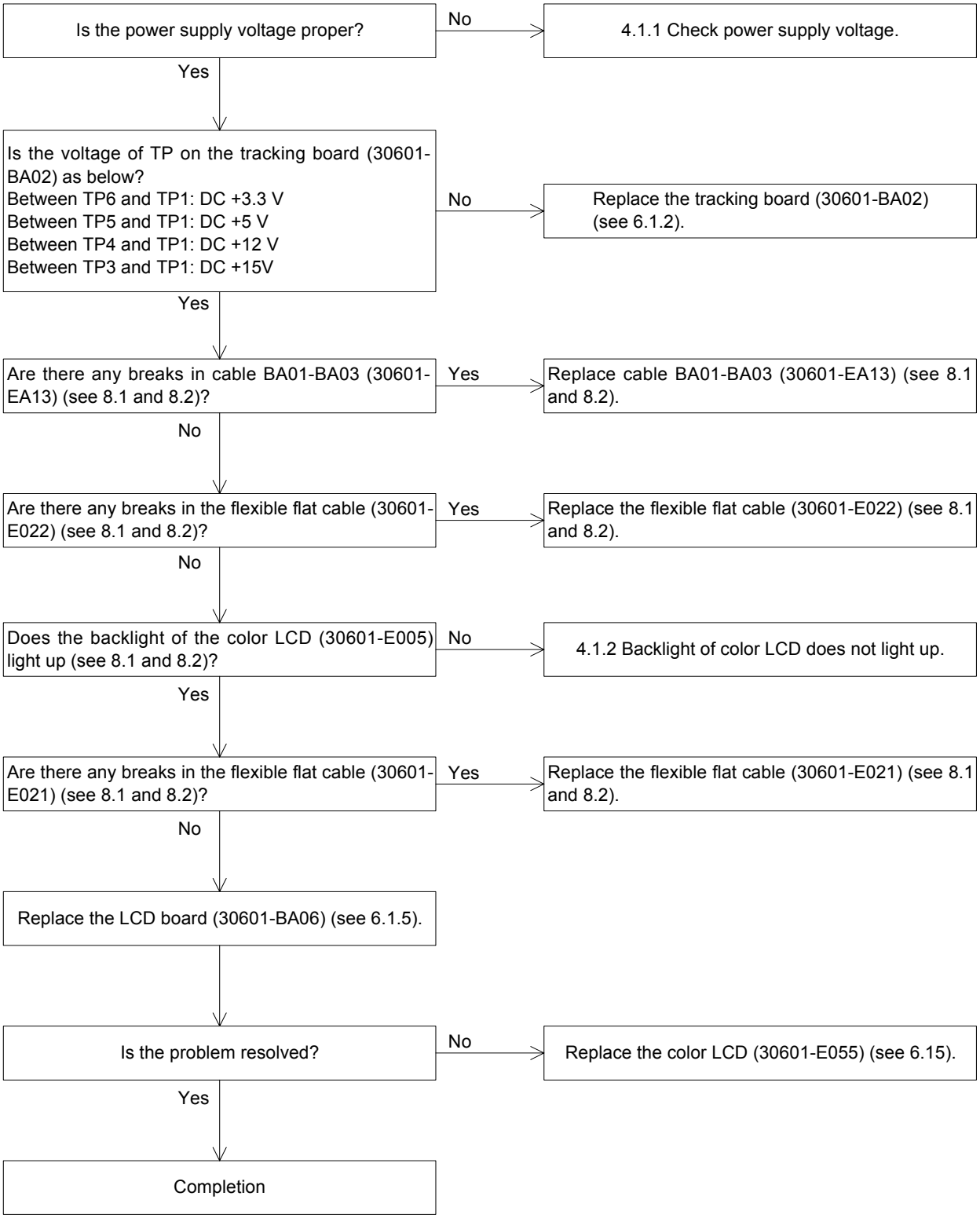
§3 TROUBLESHOOTING



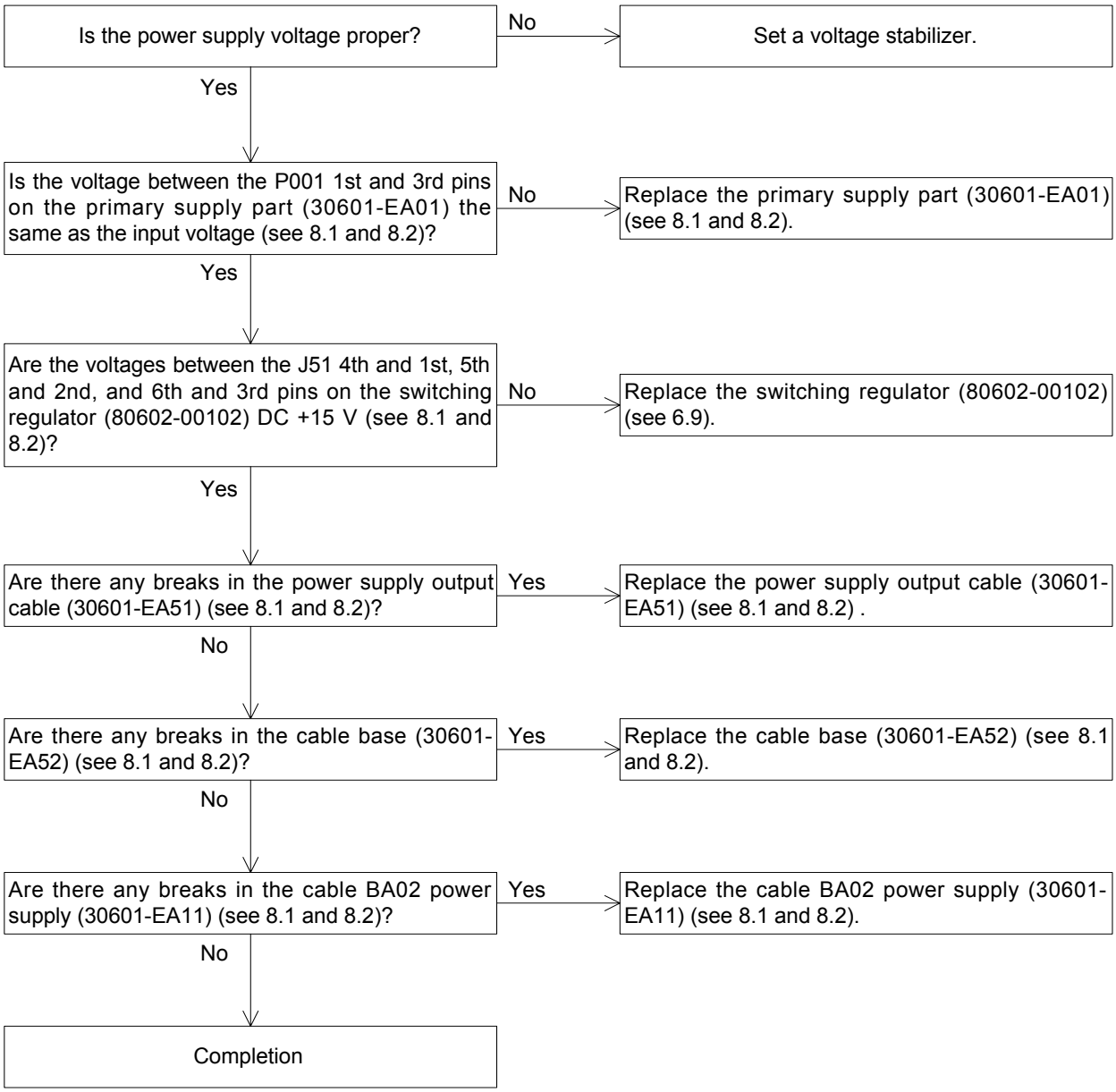

Does LCD auto light off function operate?
No
4.10 LCD Auto Light Off Function does not Operate.
Yes
Turn off the power switch.

§4 SUBTROUBLESHOOTING

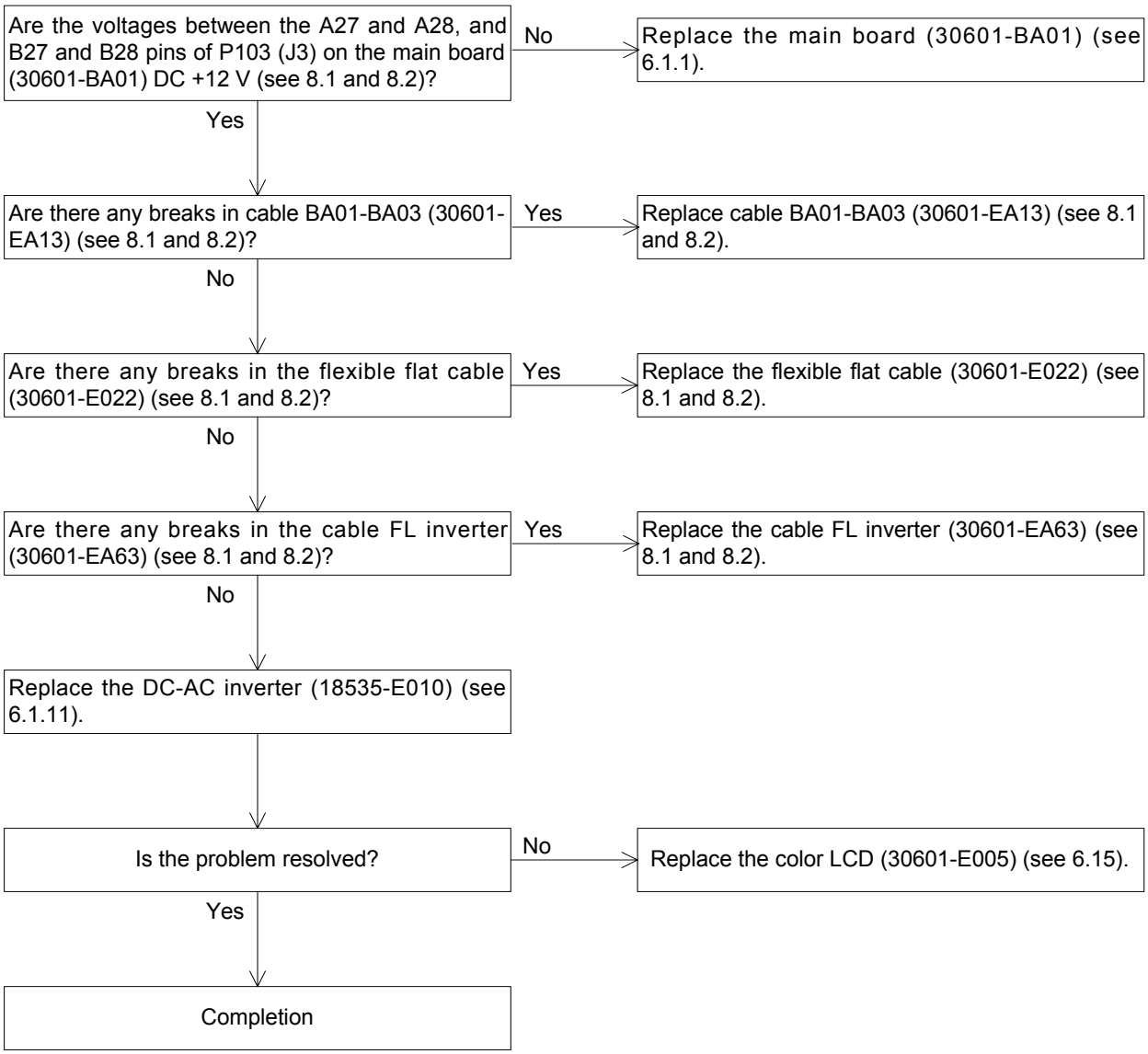
4.1 Startup Screen does not Appear.



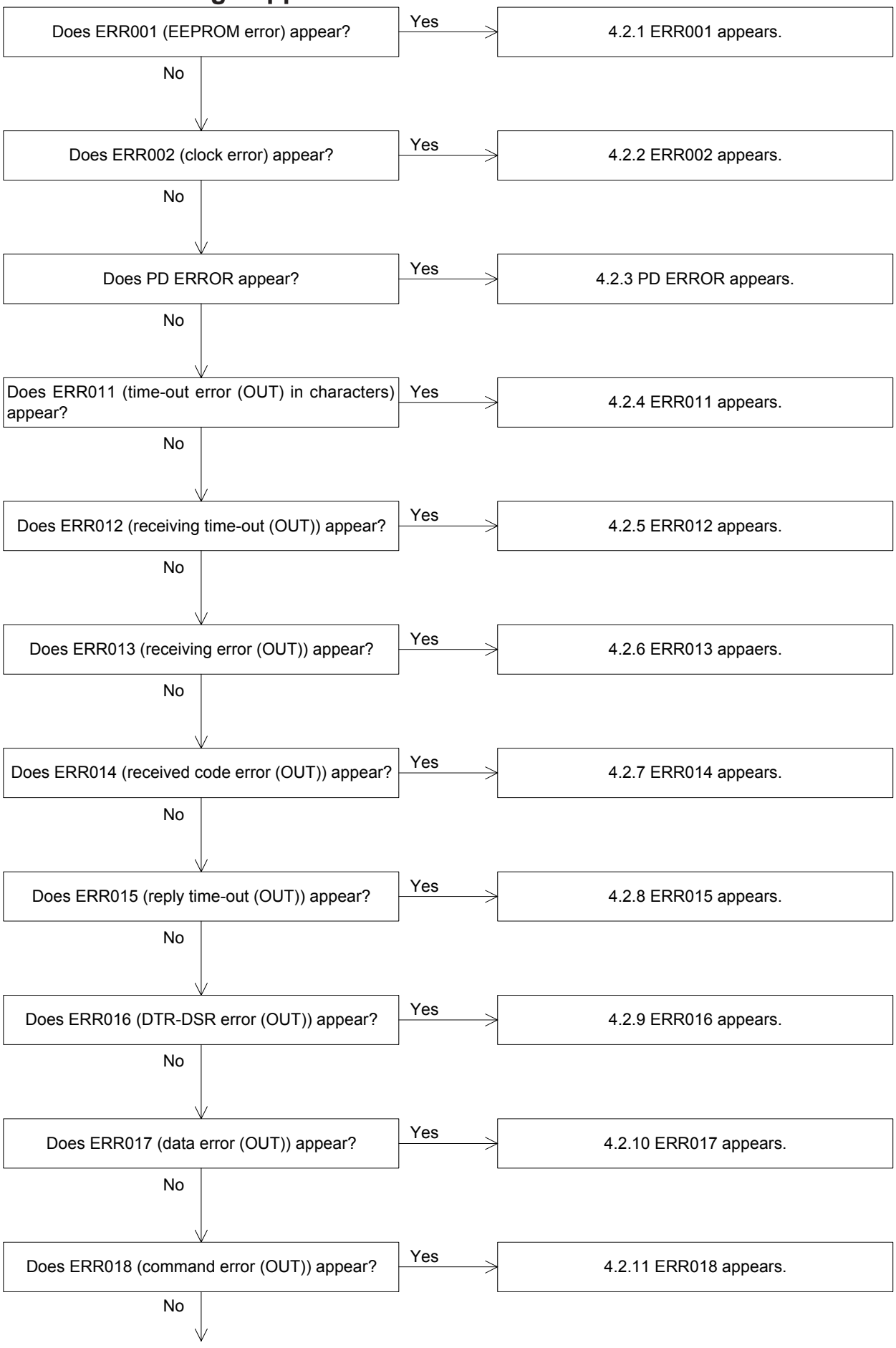
4.1.1 Checking power supply voltage

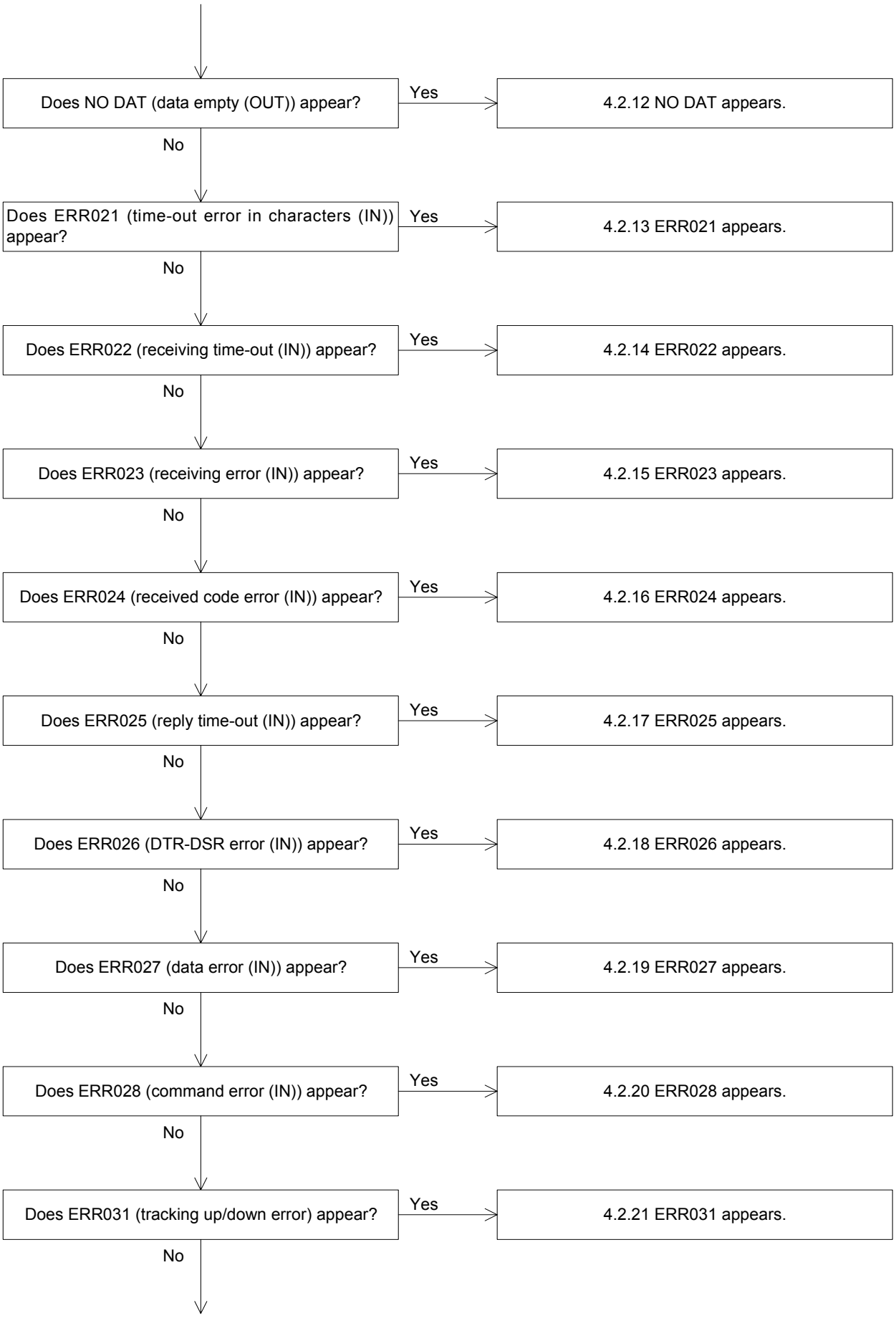


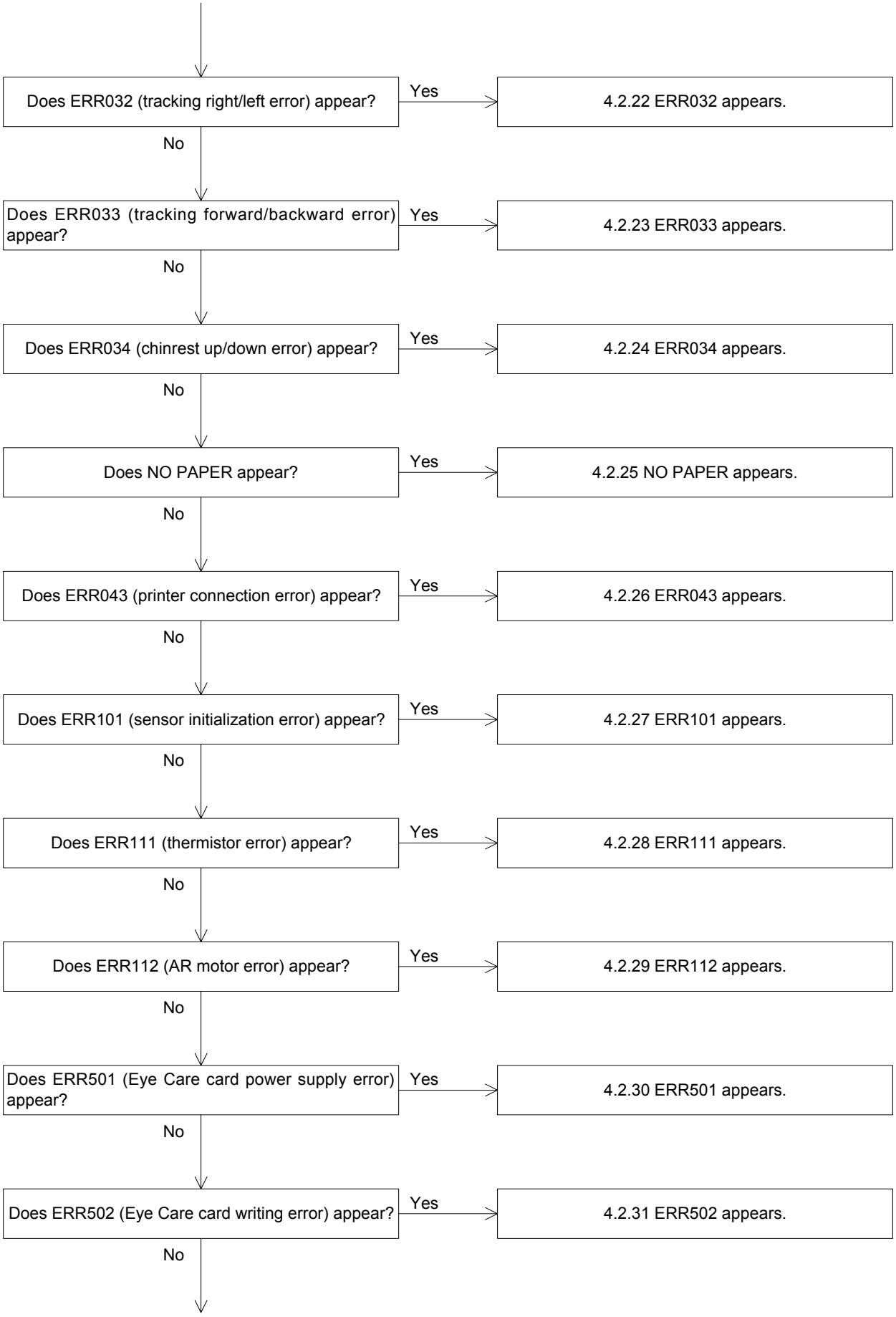
4.1.2 Backlight of color LCD does not turn up.

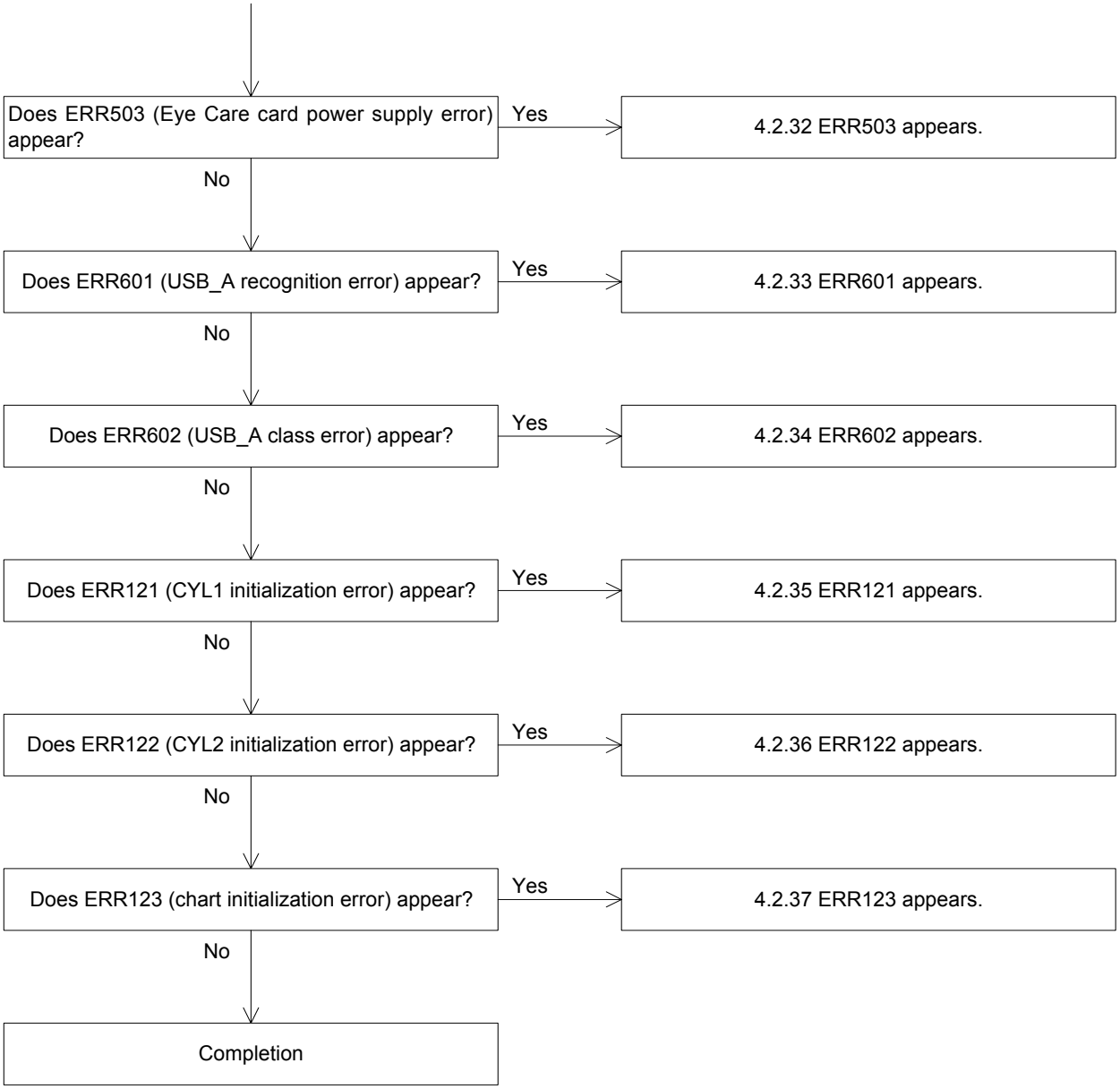


4.2 Error Message Appears.

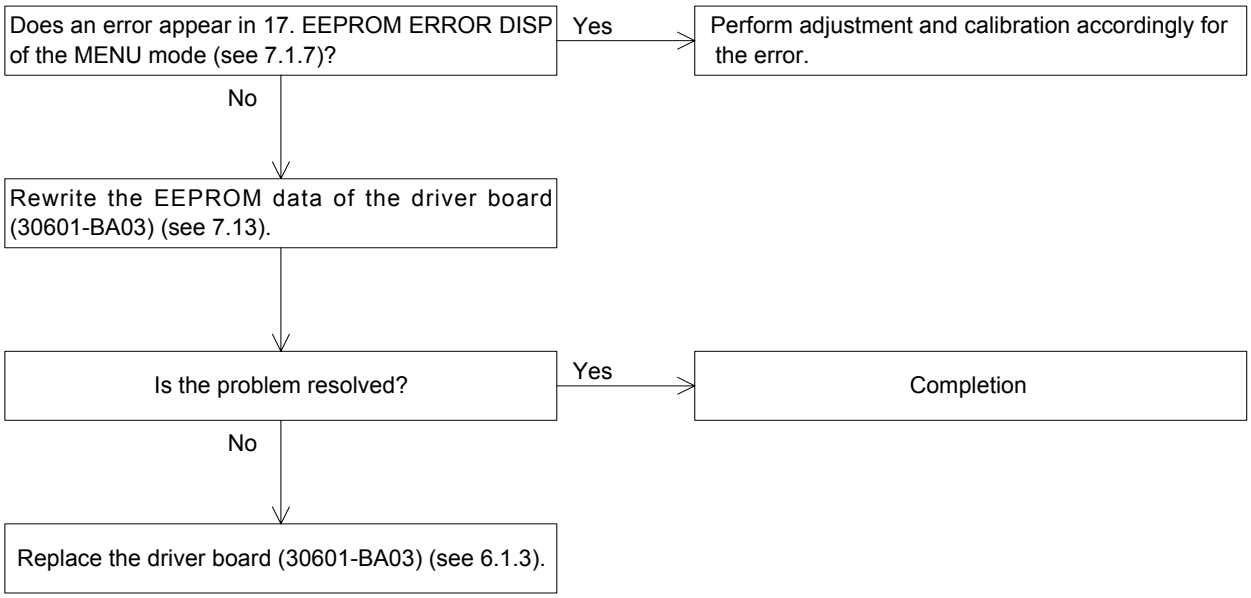



Does NO DAT (data empty (OUT)) appear?
Yes
4.2.12 NO DAT appears.
No
Does ERR021 (time-out error in characters (IN)) appear?
Yes
4.2.13 ERR021 appears.
No
Does ERR022 (receiving time-out (IN)) appear?
Yes
4.2.14 ERR022 appears.
No
Does ERR023 (receiving error (IN)) appear?
Yes
4.2.15 ERR023 appears.
No
Does ERR024 (received code error (IN)) appear?
Yes
4.2.16 ERR024 appears.
No
Does ERR025 (reply time-out (IN)) appear?
Yes
4.2.17 ERR025 appears.
No
Does ERR026 (DTR-DSR error (IN)) appear?
Yes
4.2.18 ERR026 appears.
No
Does ERR027 (data error (IN)) appear?
Yes
4.2.19 ERR027 appears.
No
Does ERR028 (command error (IN)) appear?
Yes
4.2.20 ERR028 appears.
No
Does ERR031 (tracking up/down error) appear?
Yes
4.2.21 ERR031 appears.
No

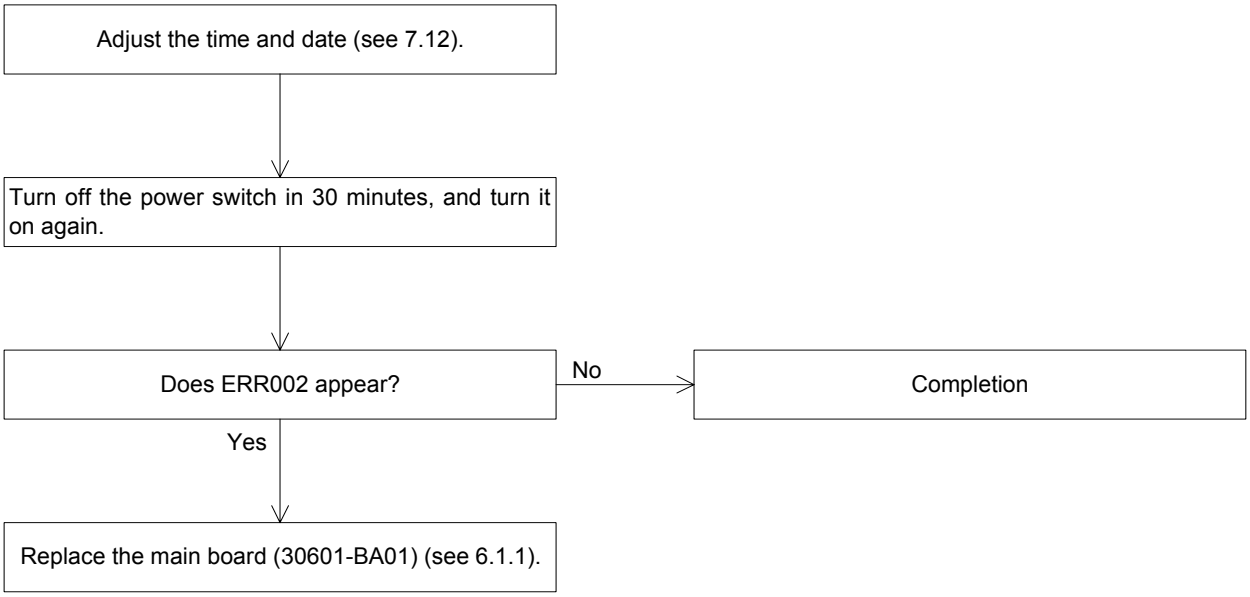

Does ERR032 (tracking right/left error) appear?
Yes
4.2.22 ERR032 appears.
No
Does ERR033 (tracking forward/backward error) appear?
Yes
4.2.23 ERR033 appears.
No
Does ERR034 (chinrest up/down error) appear?
Yes
4.2.24 ERR034 appears.
No
Does NO PAPER appear?
Yes
4.2.25 NO PAPER appears.
No
Does ERR043 (printer connection error) appear?
Yes
4.2.26 ERR043 appears.
No
Does ERR101 (sensor initialization error) appear?
Yes
4.2.27 ERR101 appears.
No
Does ERR111 (thermistor error) appear?
Yes
4.2.28 ERR111 appears.
No
Does ERR112 (AR motor error) appear?
Yes
4.2.29 ERR112 appears.
No
Does ERR501 (Eye Care card power supply error) appear?
Yes
4.2.30 ERR501 appears.
No
Does ERR502 (Eye Care card writing error) appear?
Yes
4.2.31 ERR502 appears.
No


Does ERR503 (Eye Care card power supply error) appear?
Yes
4.2.32 ERR503 appears.
No
Does ERR601 (USB_A recognition error) appear?
Yes
4.2.33 ERR601 appears.
No
Does ERR602 (USB_A class error) appear?
Yes
4.2.34 ERR602 appears.
No
Does ERR121 (CYL1 initialization error) appear?
Yes
4.2.35 ERR121 appears.
No
Does ERR122 (CYL2 initialization error) appear?
Yes
4.2.36 ERR122 appears.
No
Does ERR123 (chart initialization error) appear?
Yes
4.2.37 ERR123 appears.
No
Completion

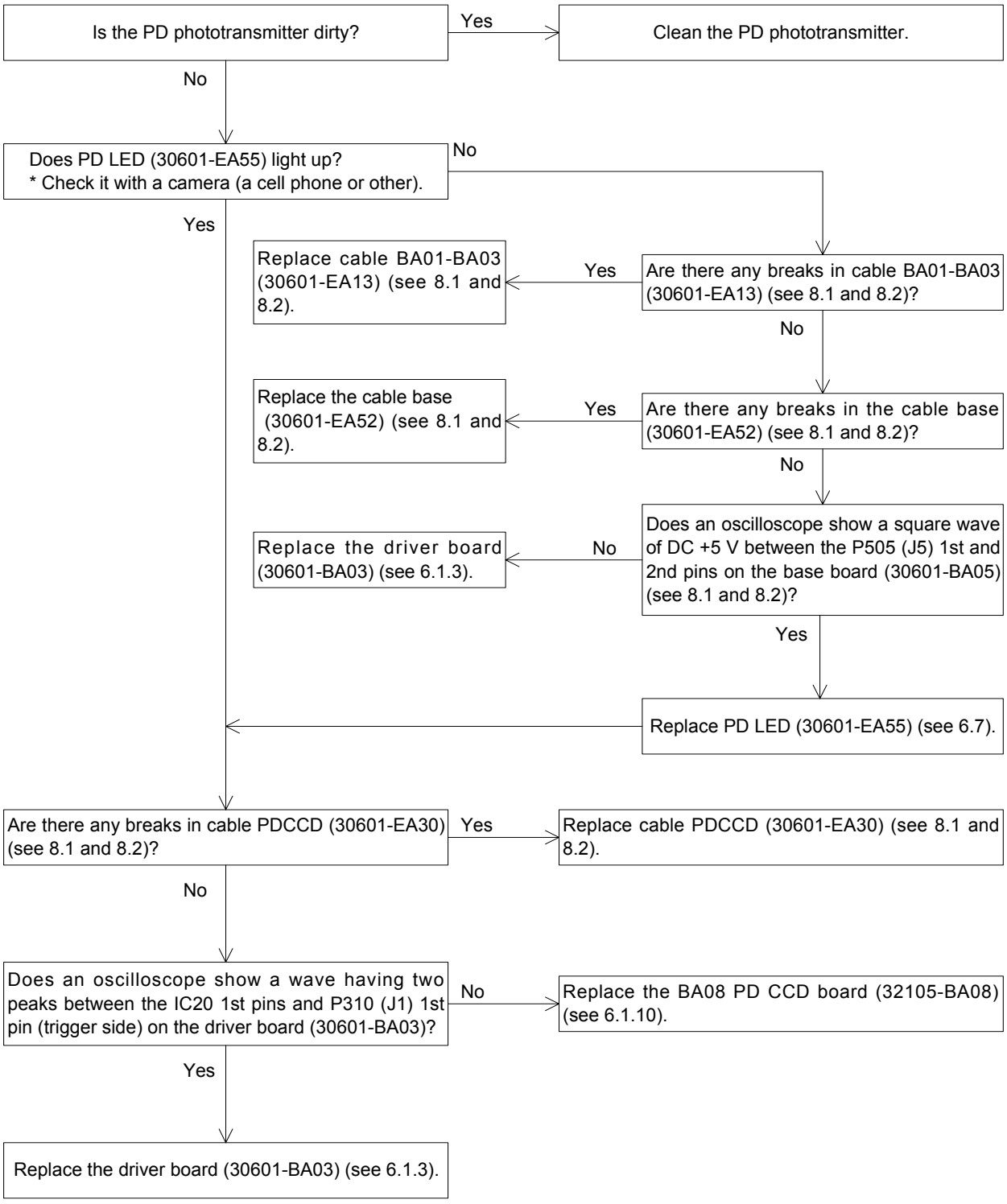
4.2.1 ERR001 appears.



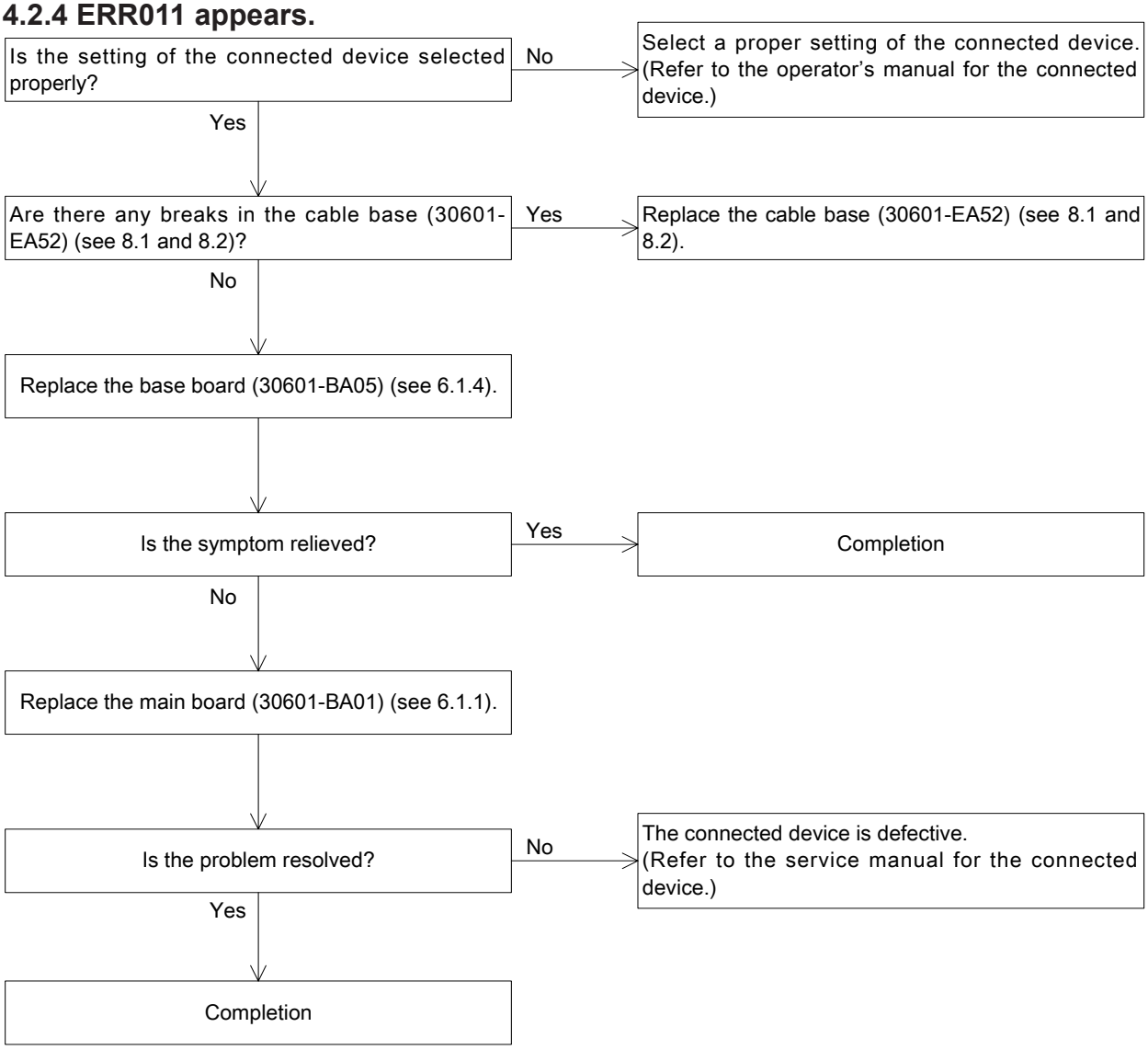
4.2.2 ERR002 appears.



4.2.3 PD ERROR appears.



4.2.4 ERR011 appears.



4.2.5 ERR012 appears.

Perform the procedures described in “ERR011 appears” (see 4.2.4).

4.2.6 ERR013 appears.

Perform the procedures described in “ERR011 appears” (see 4.2.4).

4.2.7 ERR014 appears.

Perform the procedures described in “ERR011 appears” (see 4.2.4).

4.2.8 ERR015 appears.

Perform the procedures described in “ERR011 appears” (see 4.2.4).

4.2.9 ERR016 appears.

Perform the procedures described in “ERR011 appears” (see 4.2.4).

4.2.10 ERR017 appears.

Perform the procedures described in “ERR011 appears” (see 4.2.4).

4.2.11 ERR018 appears.

Perform the procedures described in “ERR011 appears” (see 4.2.4).

4.2.12 NO DAT appears.

Perform a measurement and check if the data is displayed.

4.2.13 ERR021 appears.

Perform the procedures described in “ERR011 appears” (see 4.2.4.)

4.2.14 ERR022 appears.

Perform the procedures described in “ERR011 appears” (see 4.2.4).

4.2.15 ERR023 appears.

Perform the procedures described in “ERR011 appears” (see 4.2.4).

4.2.16 ERR024 appears.

Perform the procedures described in “ERR011 appears” (see 4.2.4).

4.2.17 ERR025 appears.

Perform the procedures described in “ERR011 appears” (see 4.2.4).

4.2.18 ERR026 appears.

Perform the procedures described in “ERR011 appears” (see 4.2.4).

4.2.19 ERR027 appears.

Perform the procedures described in “ERR011 appears” (see 4.2.4).

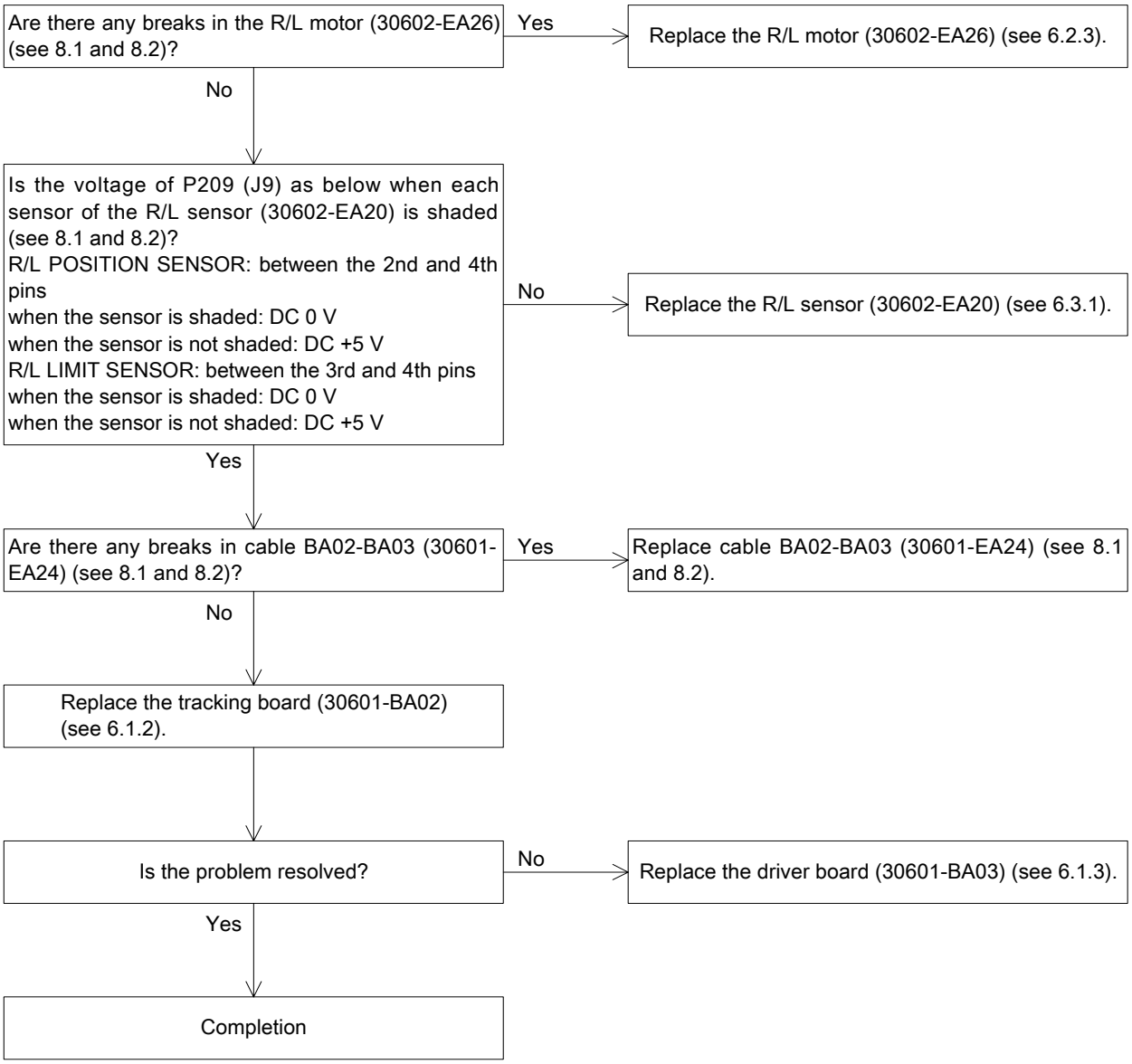
4.2.20 ERR028 appears.

Perform the procedures described in “ERR011 appears” (see 4.2.4).

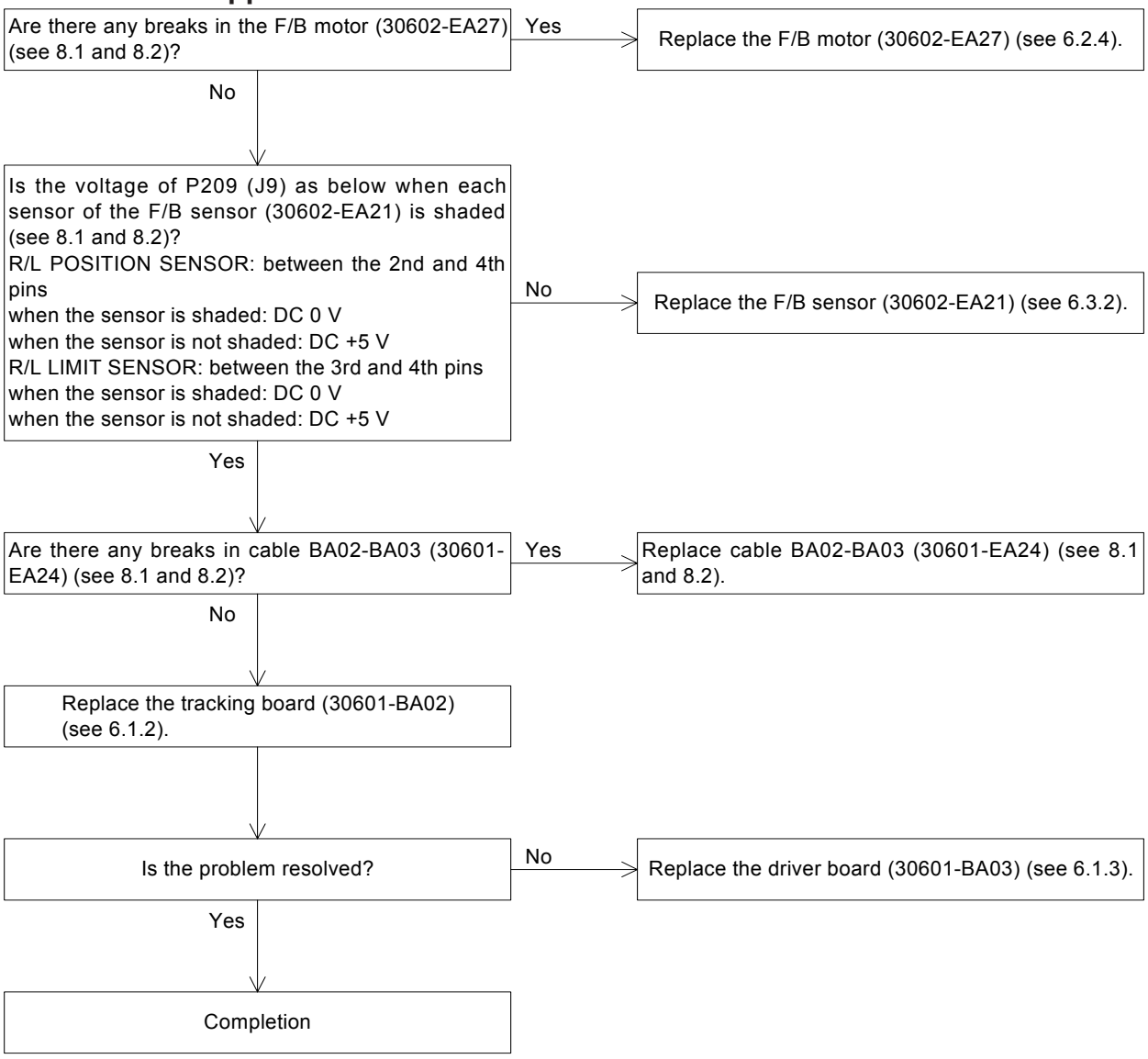
4.2.21 ERR31 appears.

Perform the procedures described in “Measurement Unit does not Move Up or Down by Tuning Joystick” (see 4.5).

4.2.22 ERR032 appears.



4.2.23 ERR033 appears.



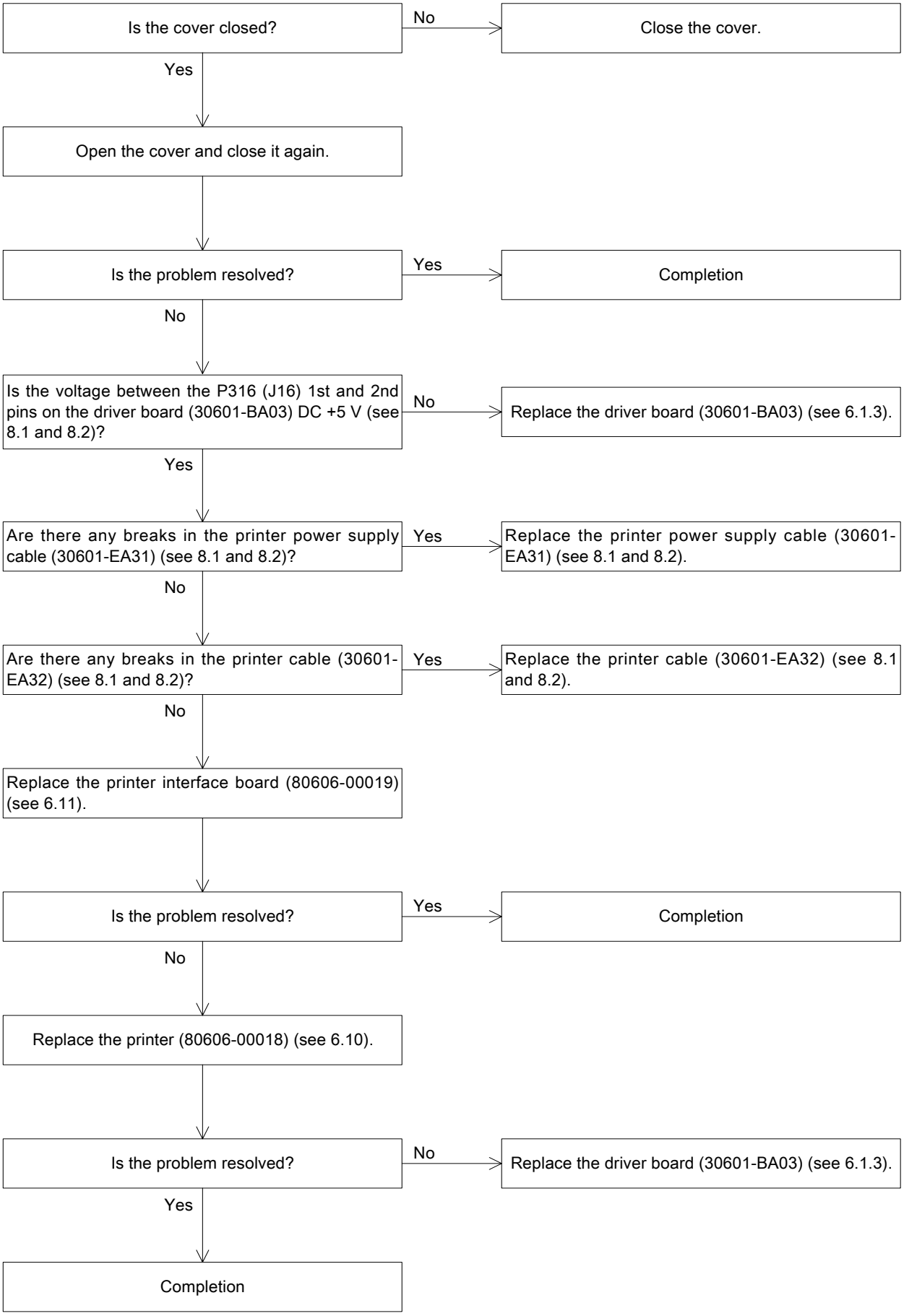
4.2.24 ERR034 appears.

Perform the procedures described in “The Chinrest does not Move” (see 4.6).

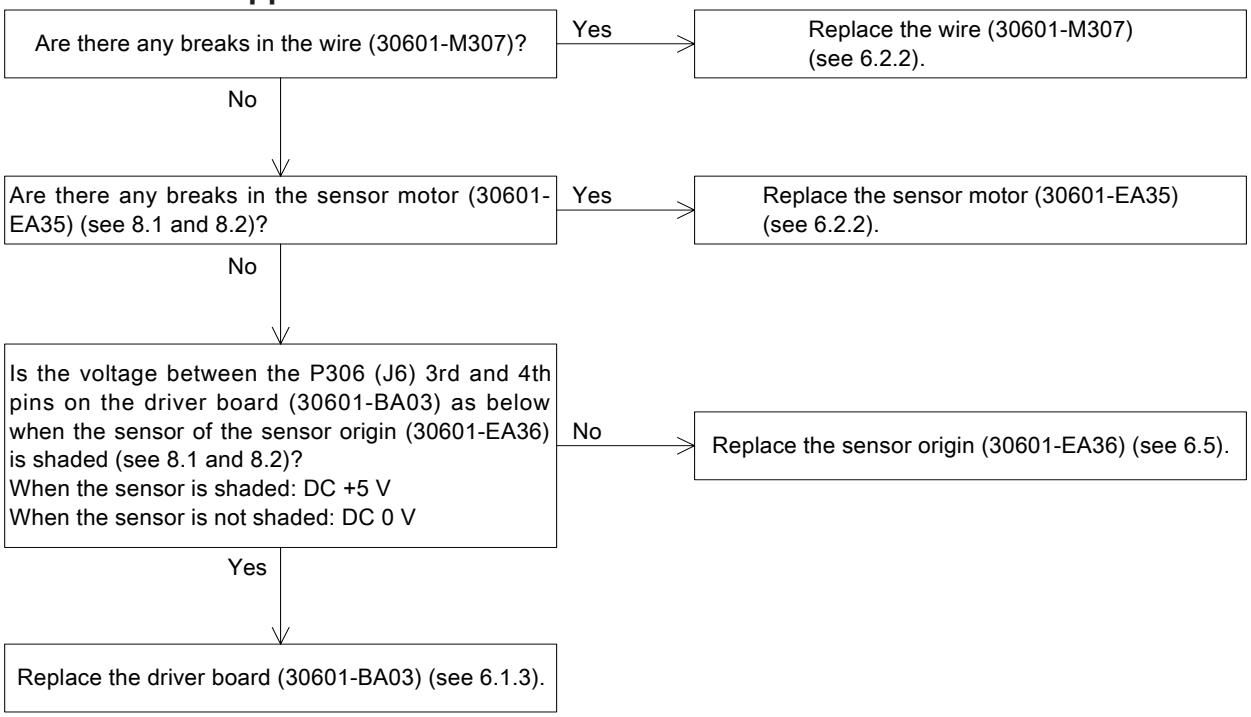
4.2.25 NO PAPER appears.

Replace the printing paper (refer to the operator’s manual for the AR-360A, AR-330A, AR-310A, ARK-560A, ARK-530A, and ARK-510A).

4.2.26 ERR043 appears.



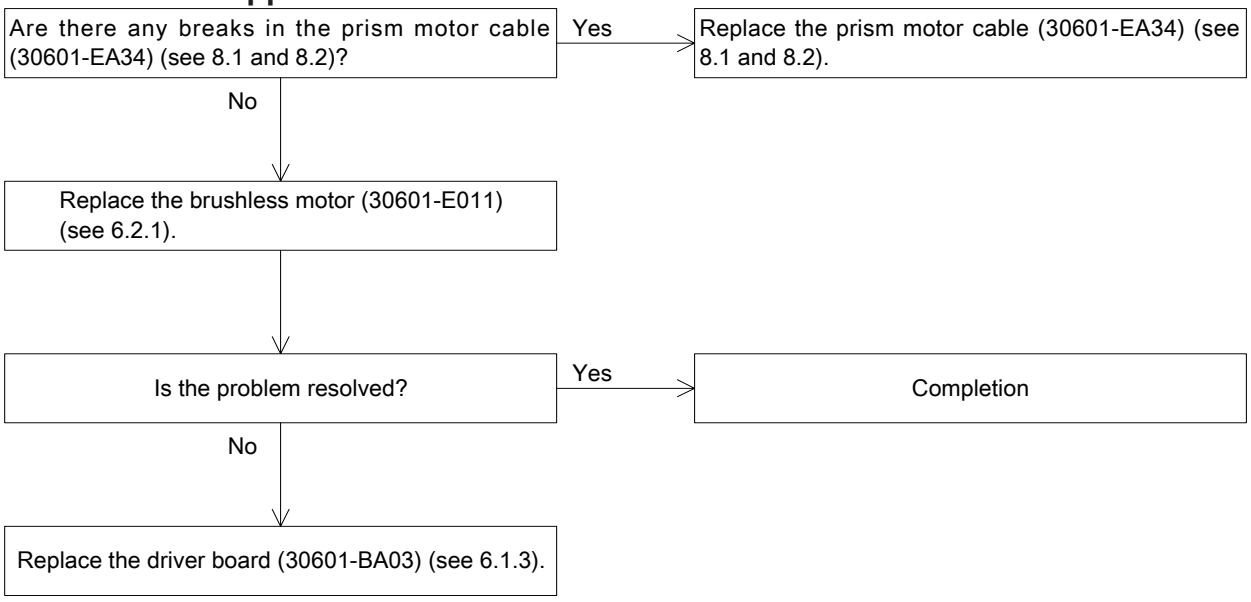
4.2.27 ERR101 appears.



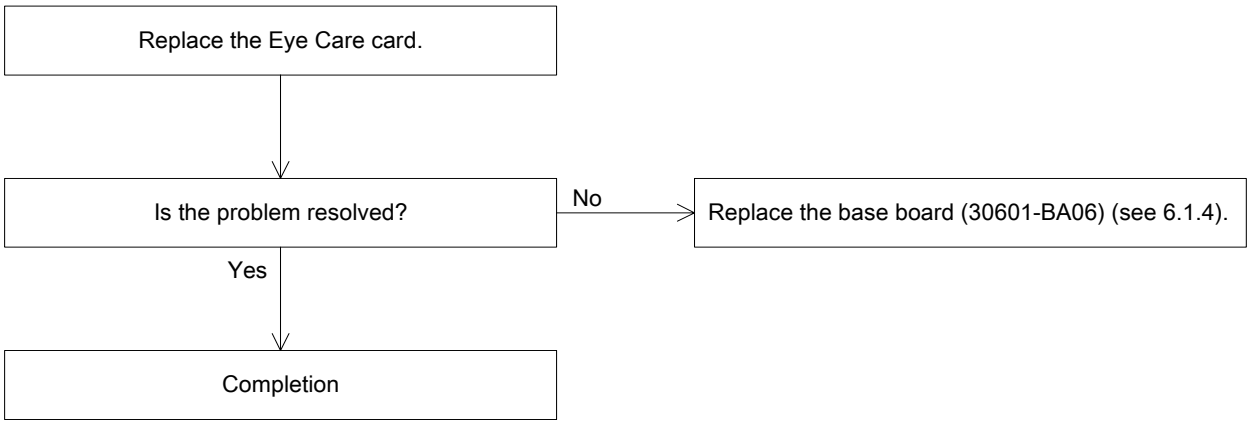
4.2.28 ERR111 appears.

Replace the driver board (30601-BA03) (see 6.1.3).

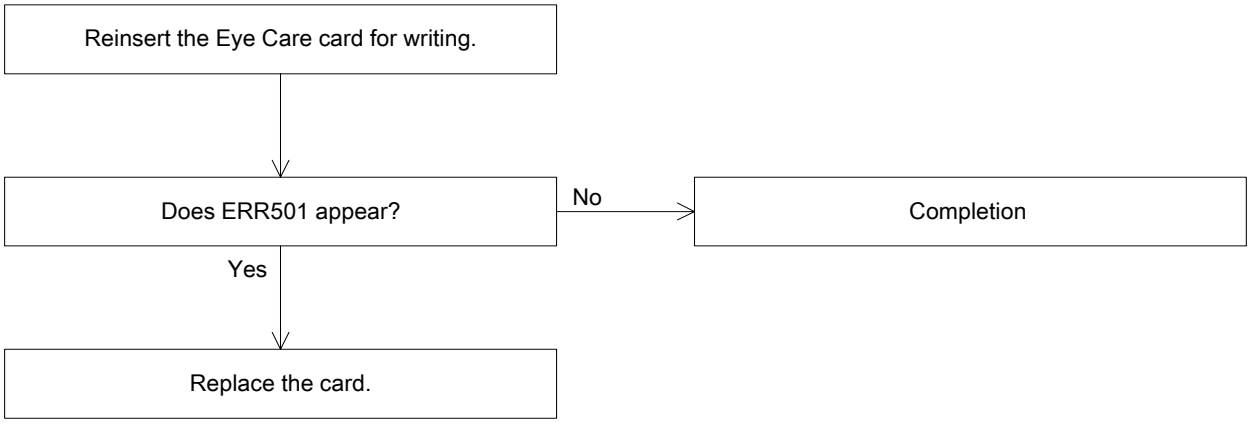
4.2.29 ERR112 appears.



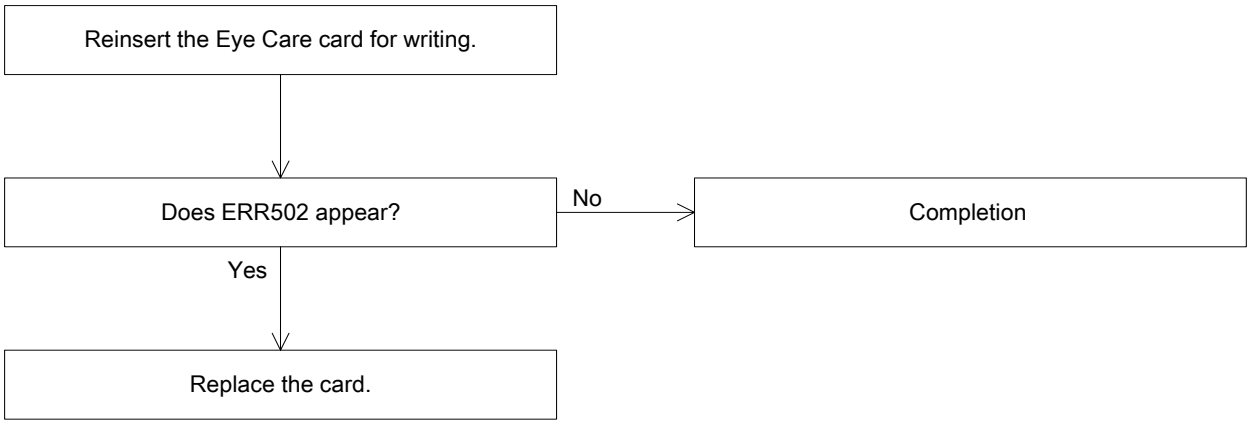
4.2.30 ERR501 appears.



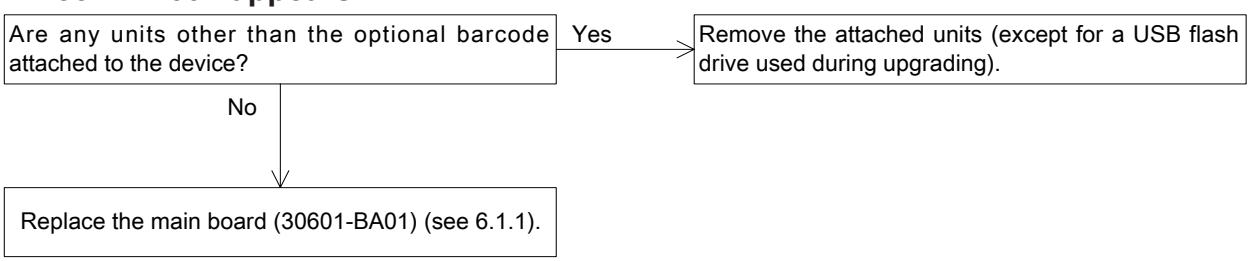
4.2.31 ERR502 appears.



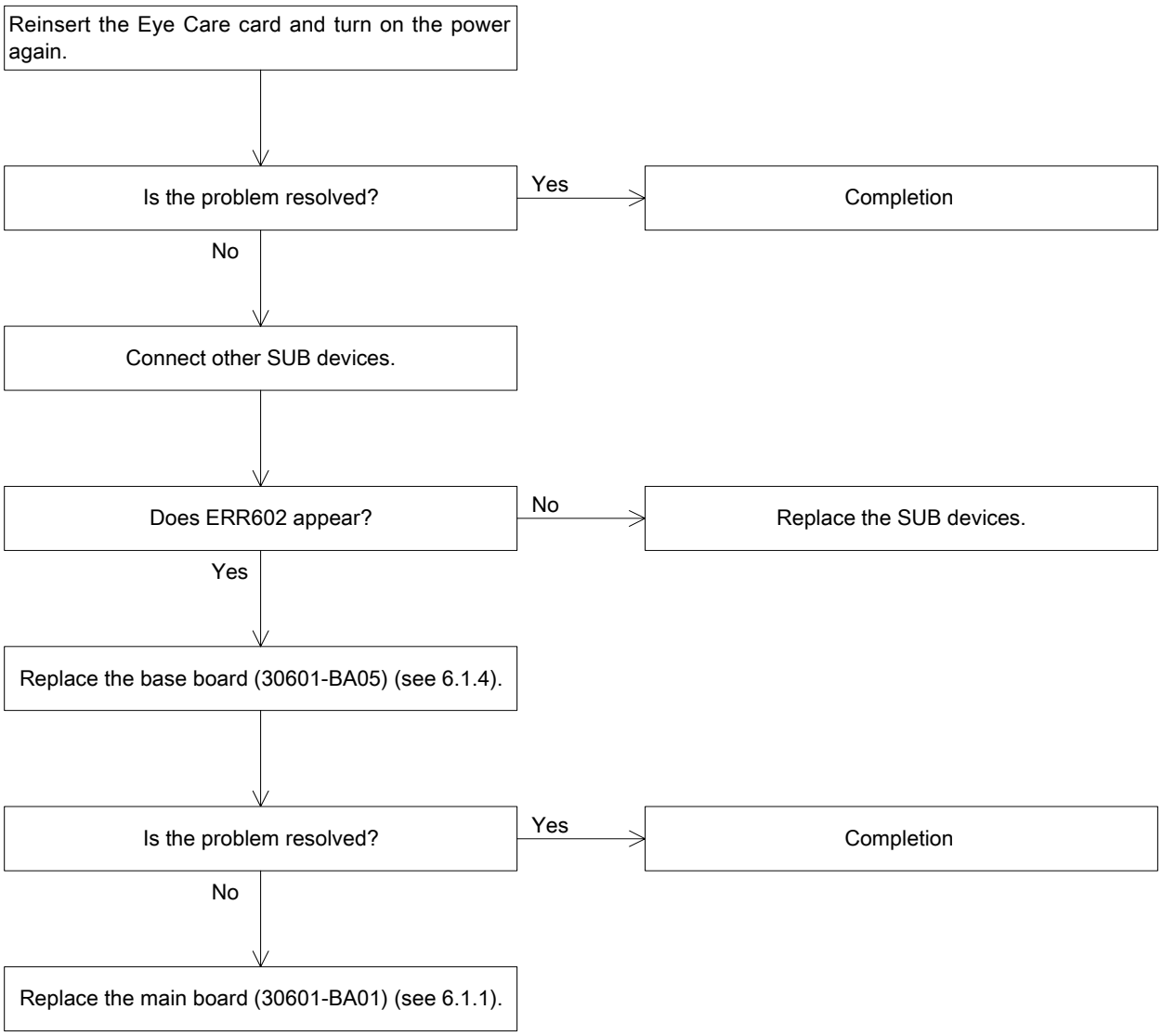
4.2.32 ERR503 appears.



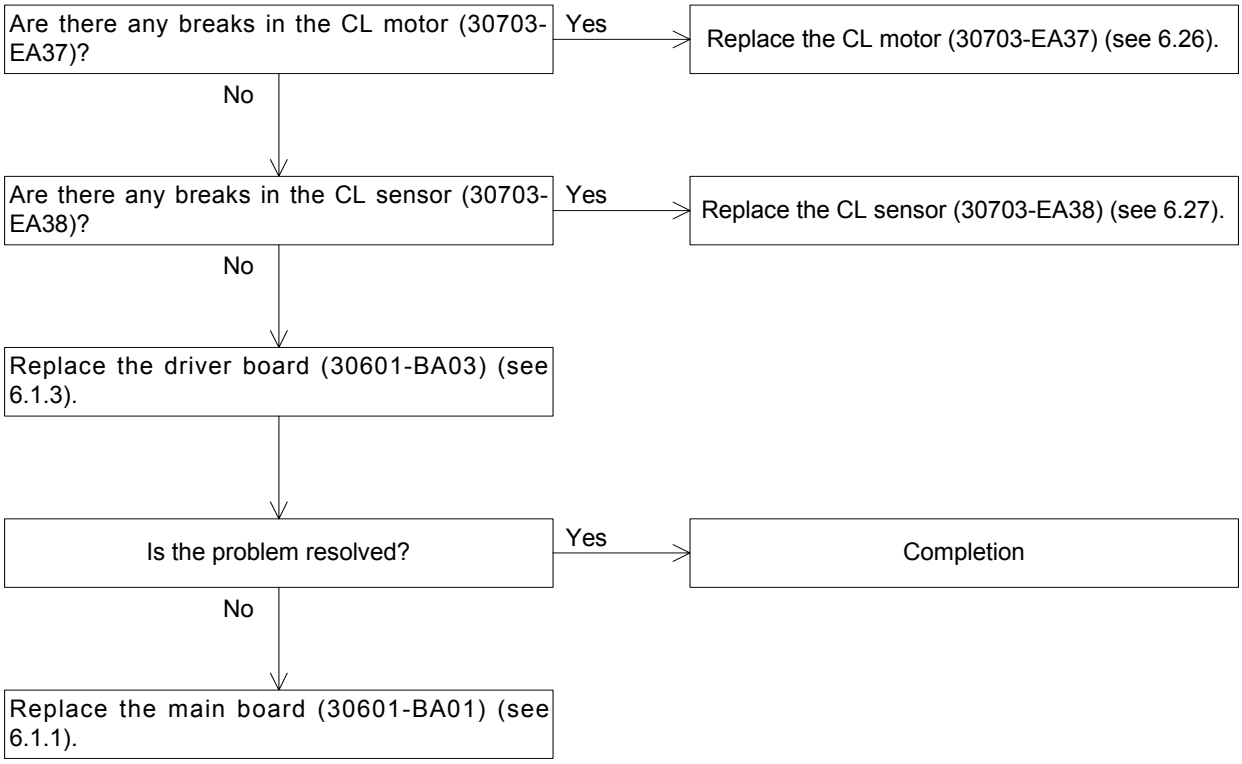
4.2.33 ERR601 appears.



4.2.34 ERR602 appears.



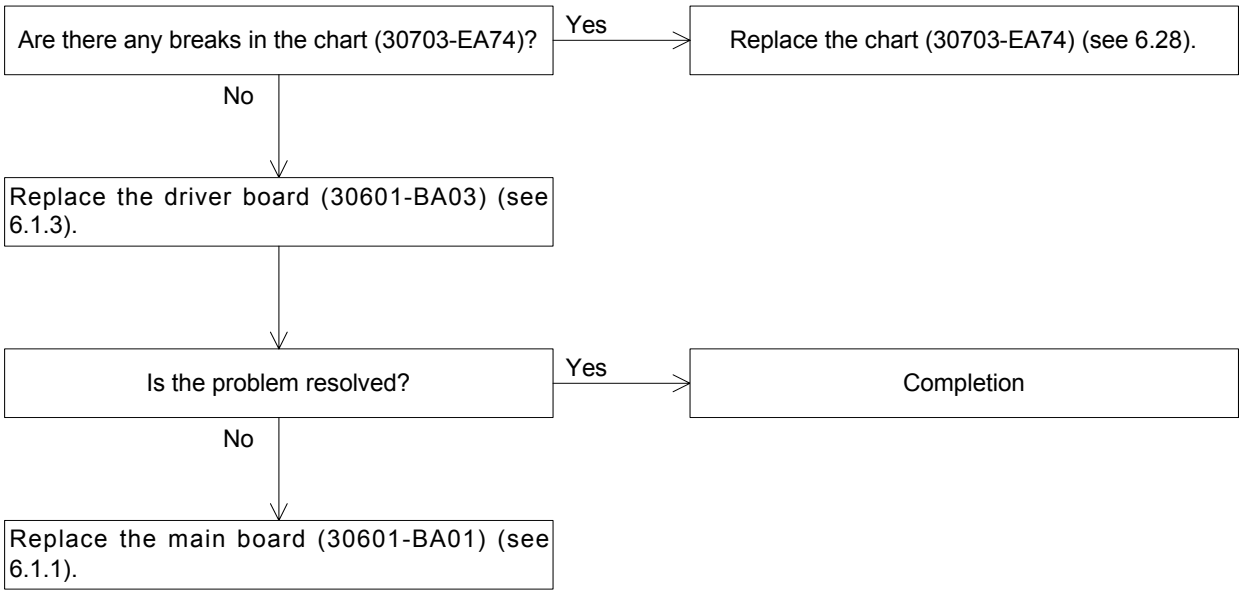
4.2.35 ERR121 appears.



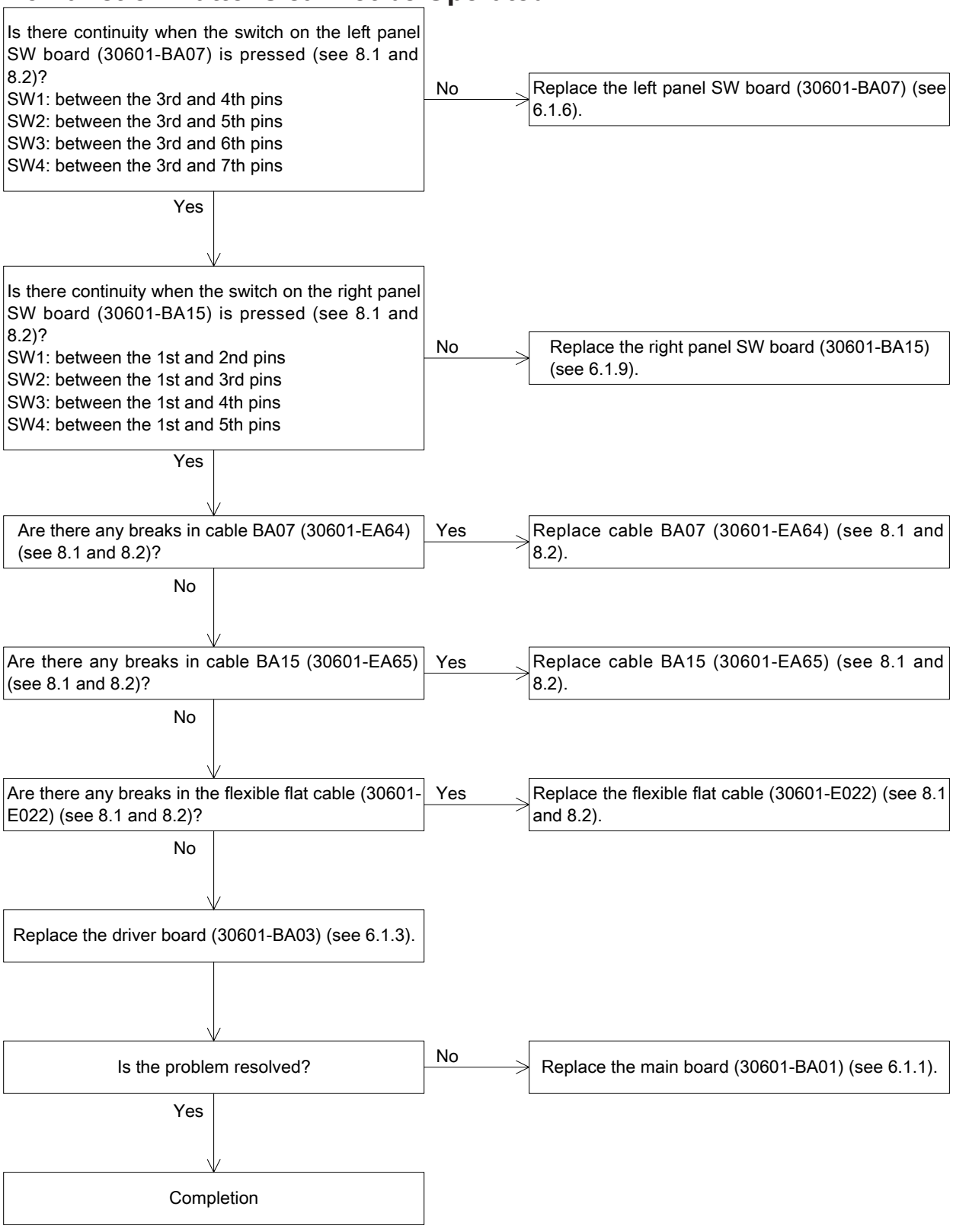
4.2.36 ERR122 appears.

Perfrom the procedures described in “4.2.35 ERR121 (CYL1 initialization error) appears” (see 4.2.35).

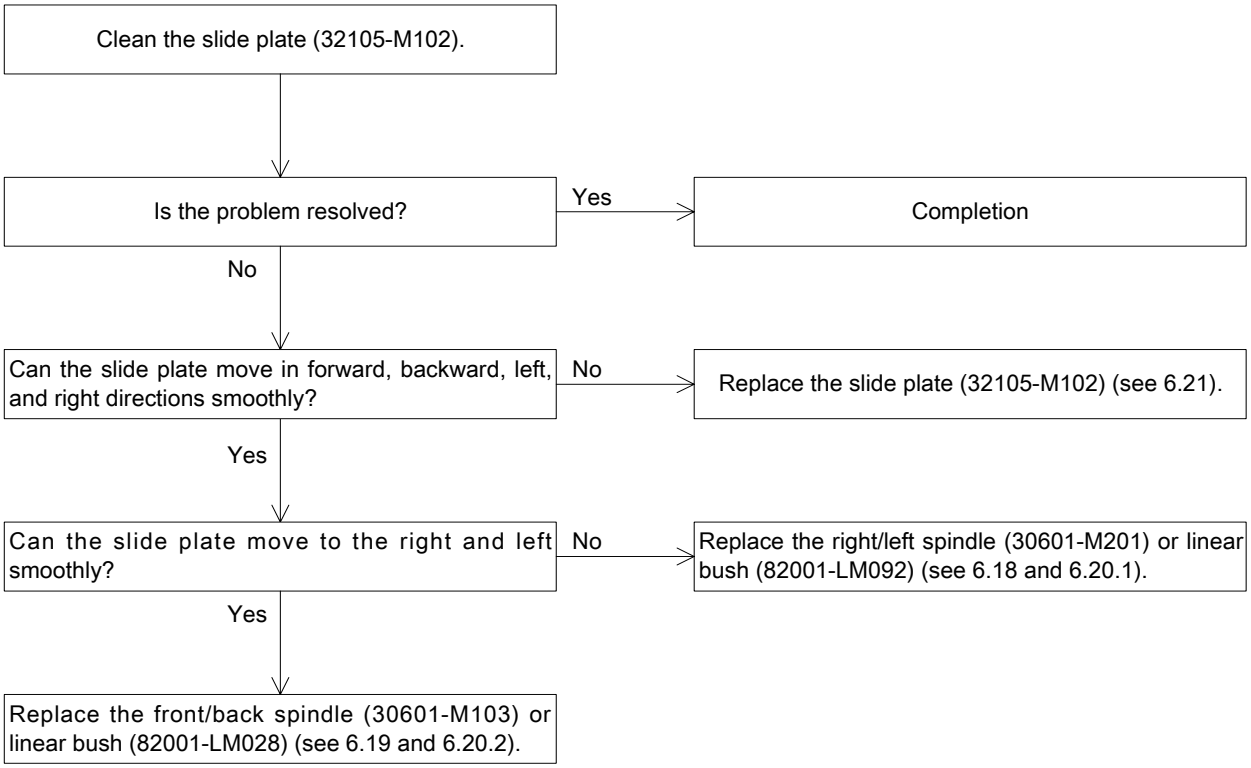
4.2.37 ERR123 appears.



4.3 Function Buttons cannot be Operated.



4.4 Horizontal Movement of Main Body is Sluggish.



4.5 Measuring Unit does not Move Up or Dow by Turning Joystick.

Are there any breaks in cable U/D (30601-EA25) (see 8.1 and 8.2)?
- Yes → Replace cable U/D (30601-EA25) (see 8.1 and 8.2).
- No ↓

Is the voltage between the P205 (J5) 8th and 9th pins on the tracking board (30601-BA02) DC +5 V (see 8.1 and 8.2)?
- No → Replace the tracking board (30601-BA02). (see 6.1.2).
- Yes ↓

Is the waveform of the output voltage between the 6th and 9th, and 7th and 9th pins of P205 (J5) on the U/D SW board (30601-BA09) as illustrated below when the joystick is turned (see 8.1 and 8.2)? (The frequency varies according to the rotation velocity of the joystick.)



- No → Replace the joystick ASSY (30601-2100) (see 6.8).
- Yes ↓

Are there any breaks in the BA02 power supply cable (30601-EA11) (see 8.1 and 8.2)?
- Yes → Replace the BA02 power supply cable (30601-EA11) (see 8.1 and 8.2).
- No ↓

Is the voltage of P211 (J11) as below when each sensor of the U/D sensor (30602-EA22) is shaded (see 8.1 and 8.2)?
UP LIMIT SENSOR
When shaded: DC 0 V between the 3rd and 4th pins
When not shaded: DC +5 V between the 3rd and 4th pins
DOWN LIMIT SENSOR
When shaded: DC 0 V between the 2nd and 4th pins
When not shaded: DC +5 V between the 2nd and 4th pins
- No → Replace the U/D sensor (30602-EA22) (see 6.3.3).
- Yes ↓

Does the output voltage between the P208 (J8) 1st and 2nd pins on the tracking board (30601-BA02) vary in the range of 0 to 12 V (see 8.1 and 8.2)? (Turning the joystick CW or CCW inverts the + and - outputs.)
- No → Replace the tracking board (30601-BA02) (see 6.1.2).
- Yes ↓

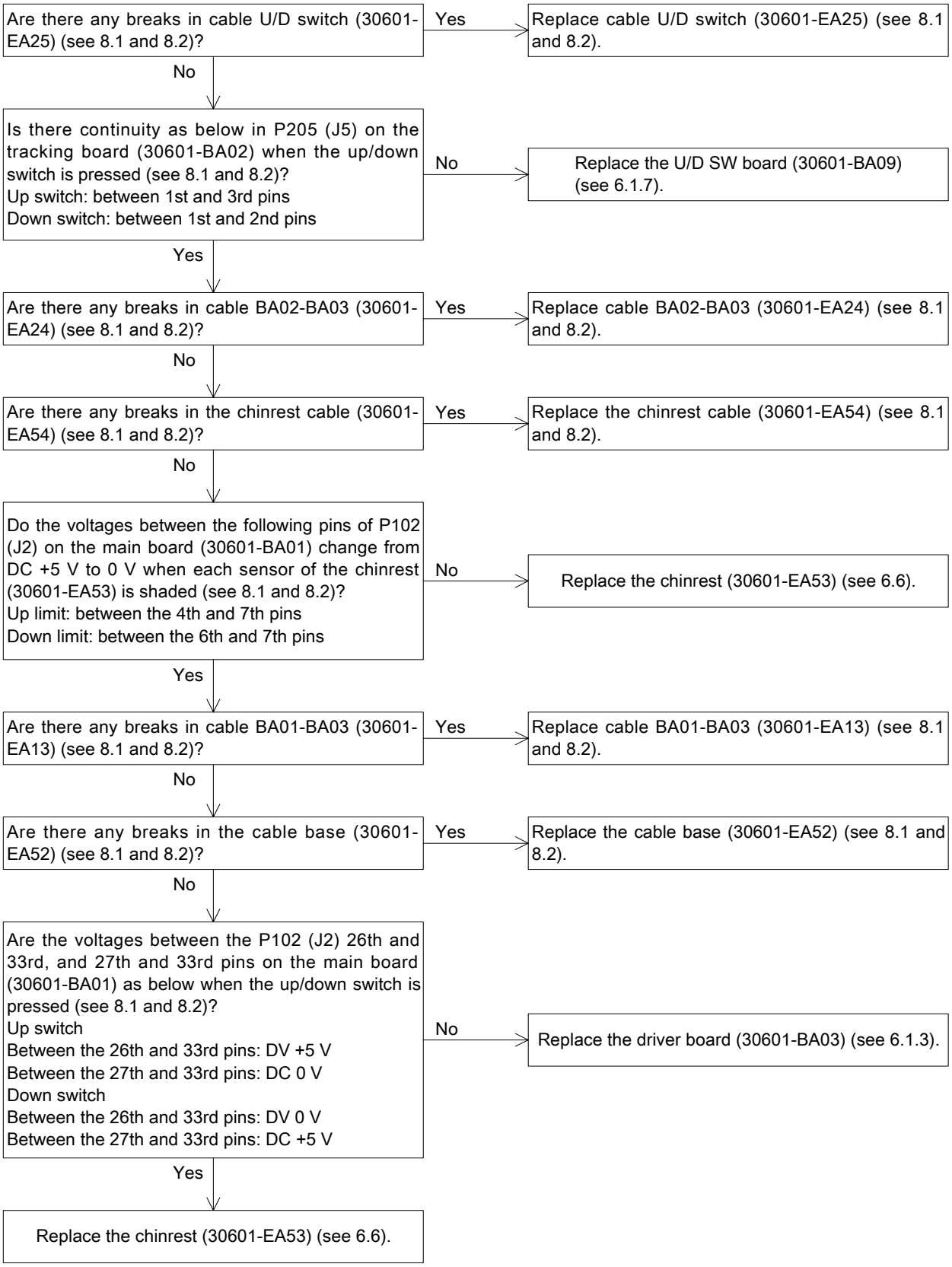
Replace the U/D motor (30601-EA28) (see 6.2.5).

↓

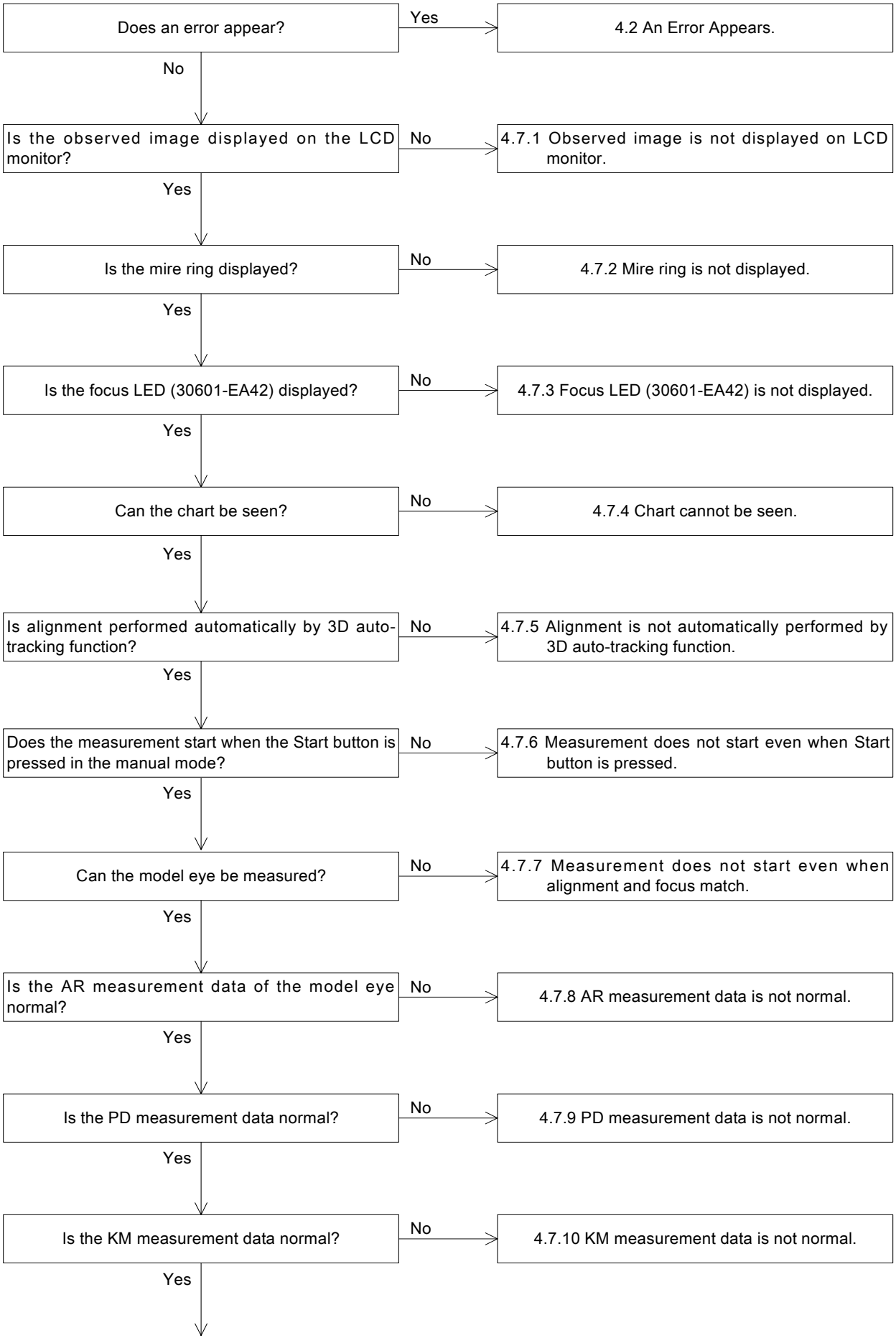
Is the problem resolved?
- No → Replace the main board (30601-BA01) (see 6.1.1).
- Yes ↓

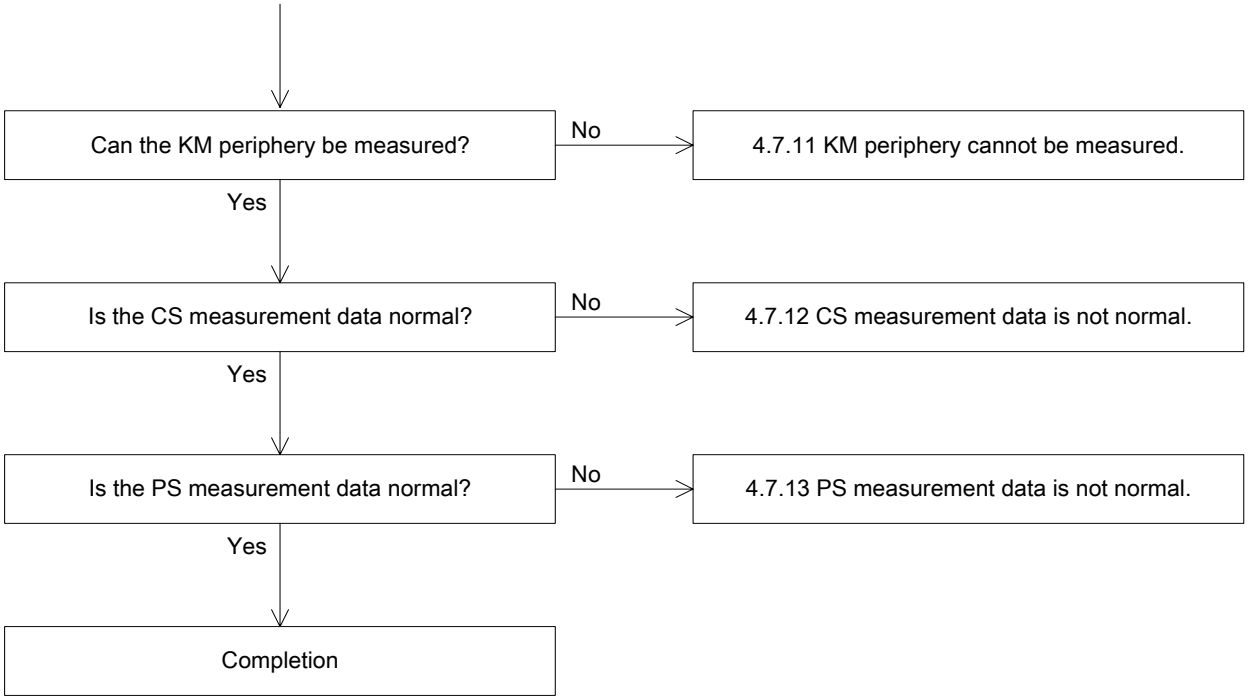
Completion

4.6 Chinrest does not Move.

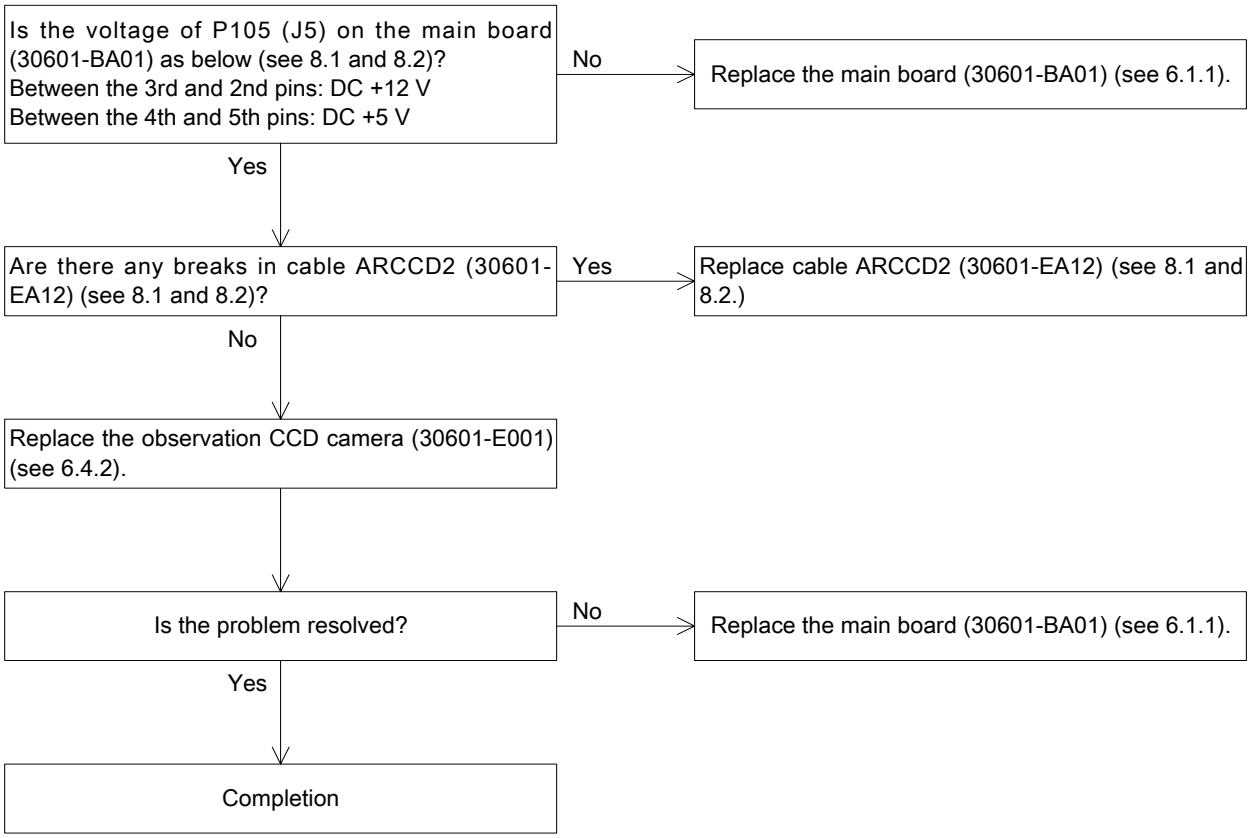


4.7 Measurement cannot be Performed Properly.

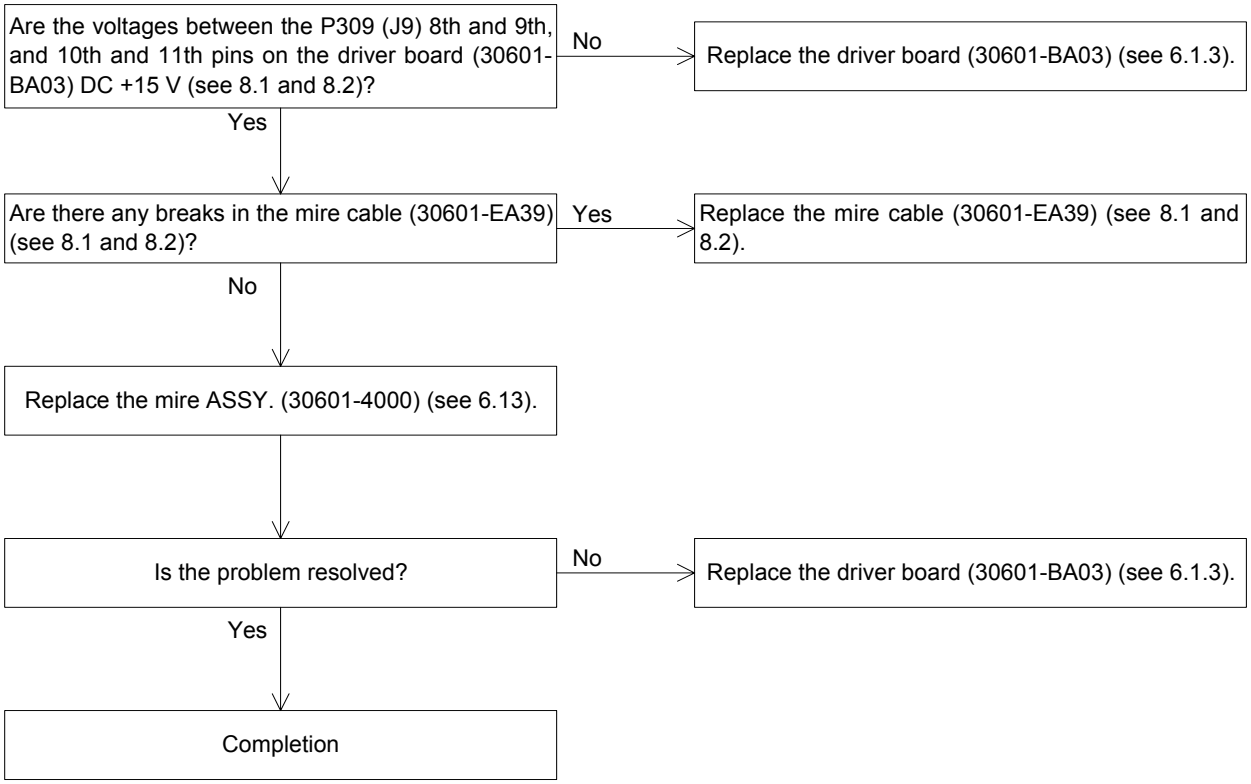



Can the KM periphery be measured?
No
4.7.11 KM periphery cannot be measured.
Yes
Is the CS measurement data normal?
No
4.7.12 CS measurement data is not normal.
Yes
Is the PS measurement data normal?
No
4.7.13 PS measurement data is not normal.
Yes
Completion

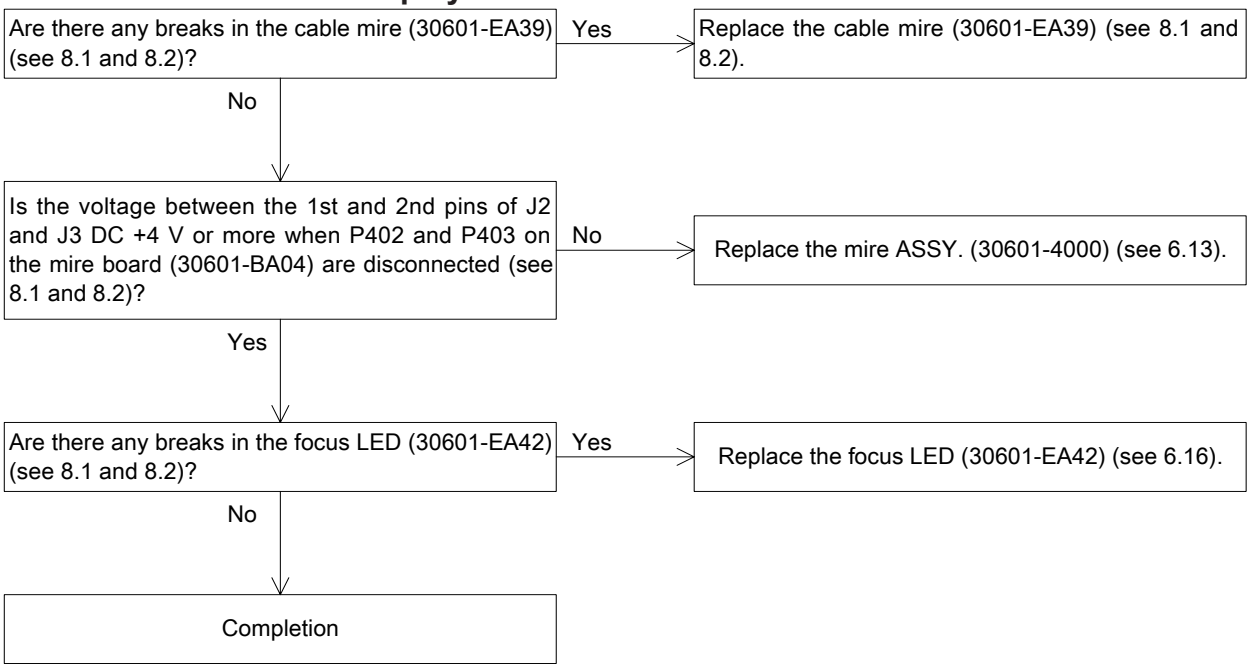
4.7.1 Observed image is not displayed on LCD monitor.



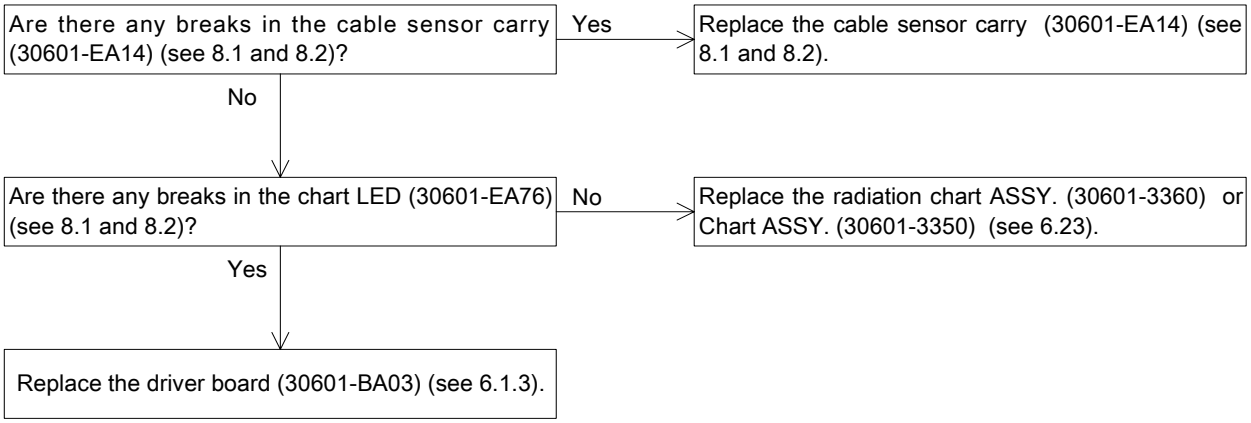
4.7.2 Mire ring is not displayed.



4.7.3 Focus LED is not displayed.



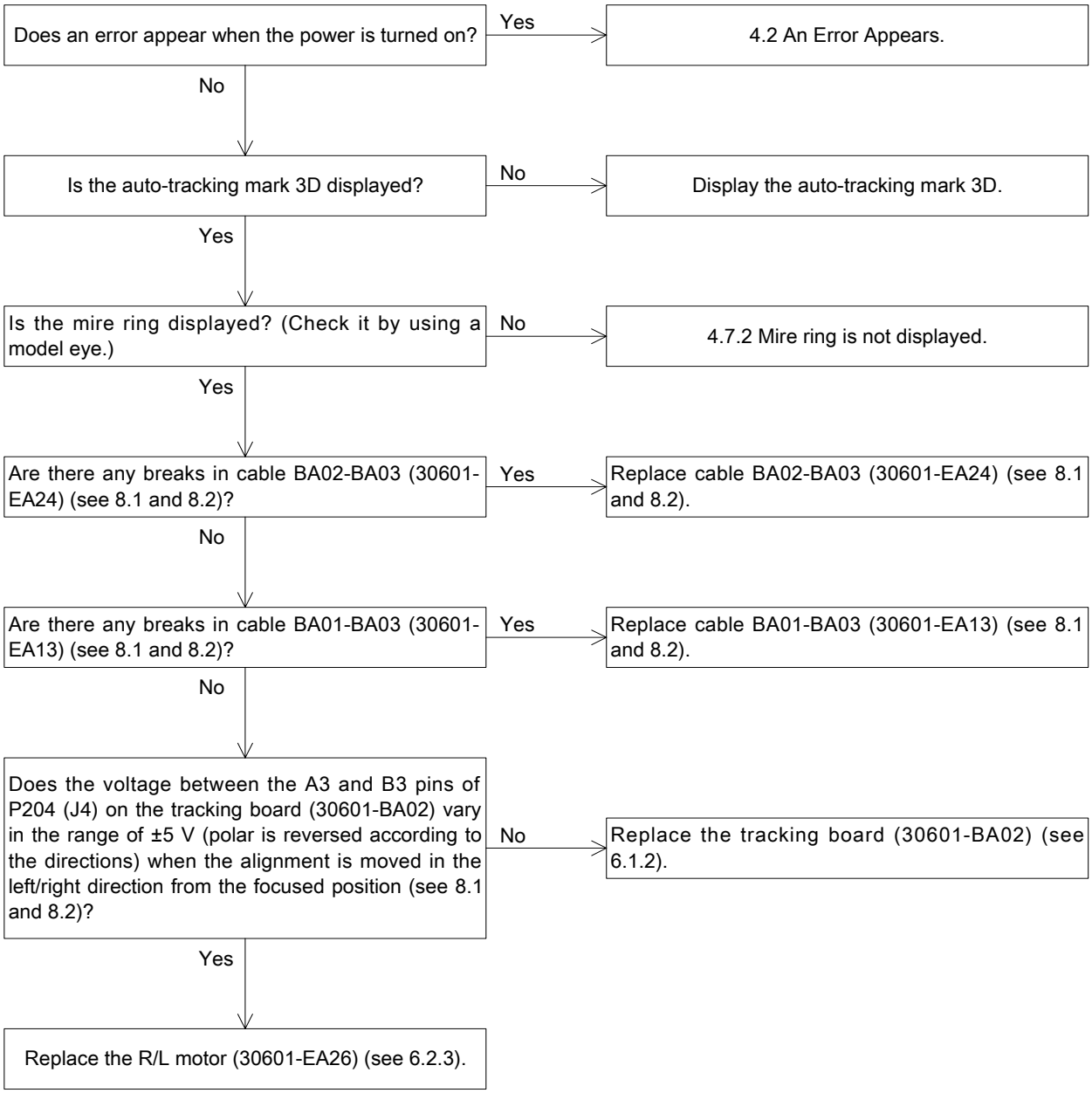
4.7.4 Chart cannot be seen.



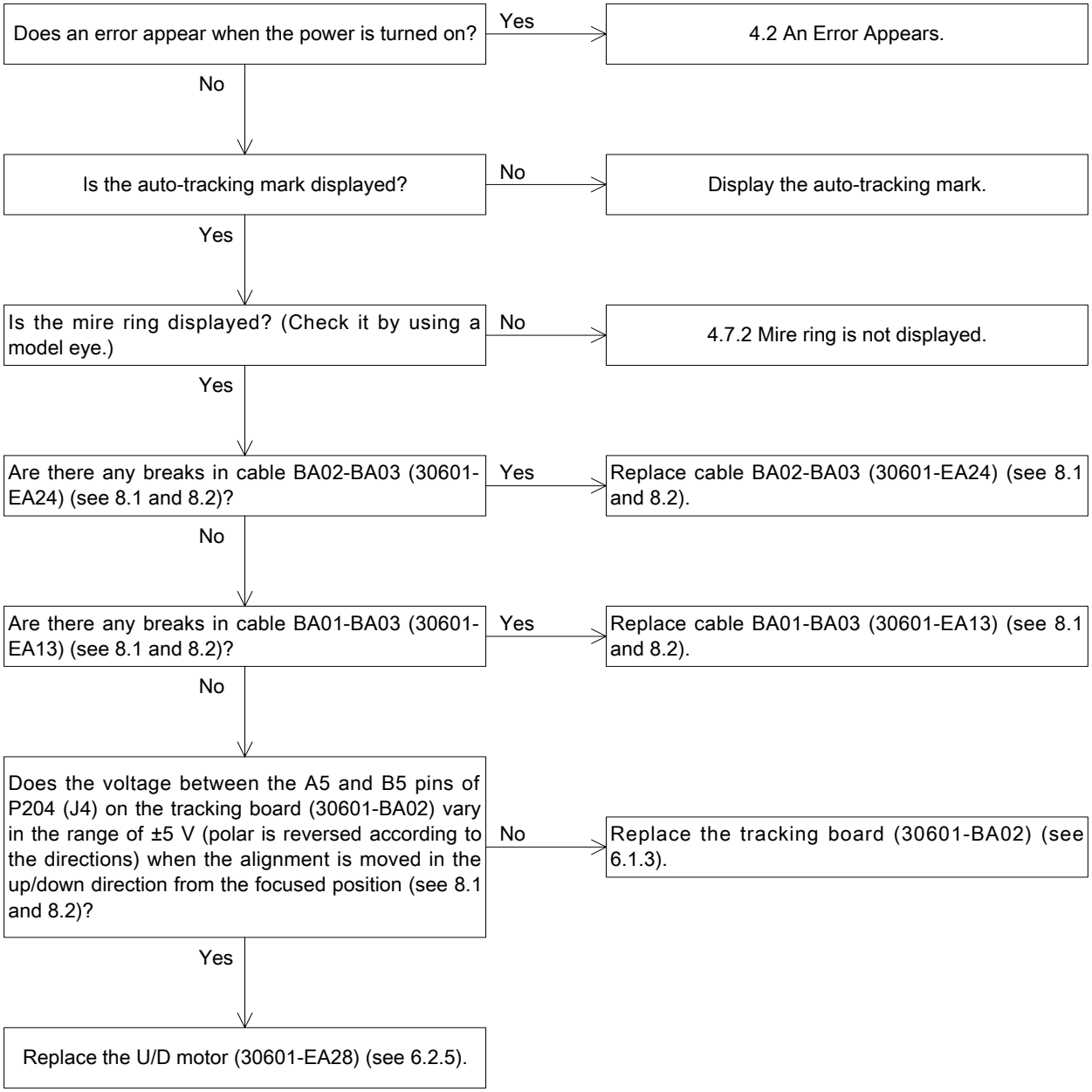
4.7.5 Alignment is not automatically performed by 3D auto-tracking function.

4.7.5.1 Alignment is not performed in left/right direction.

* Applicable for AR-330A, ARK-530A, AR-360A, and ARK-560A only

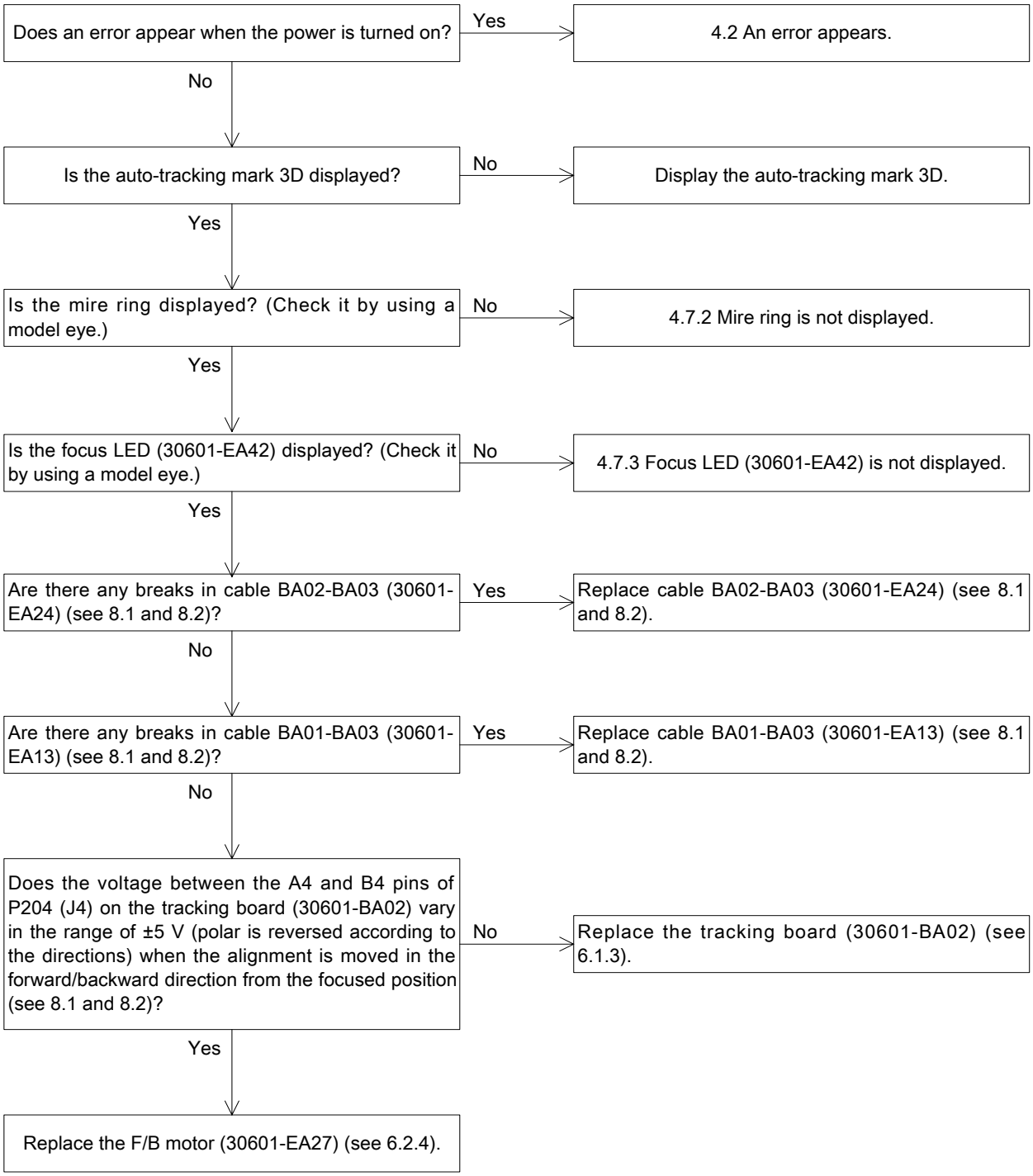


4.7.5.2 Alignment is not performed in up/down direction.

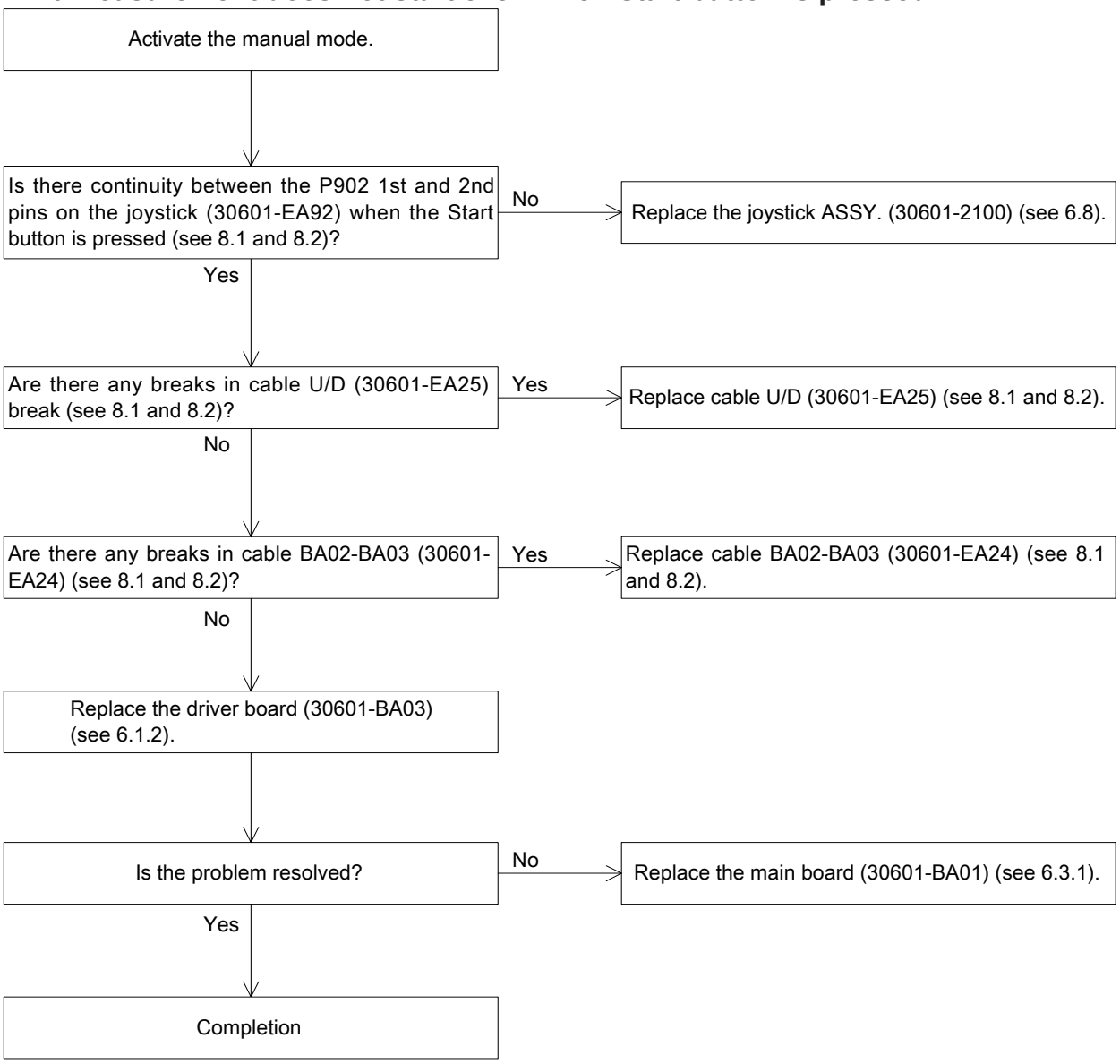


4.7.5.3 Alignment is not performed in forward/backward direction.

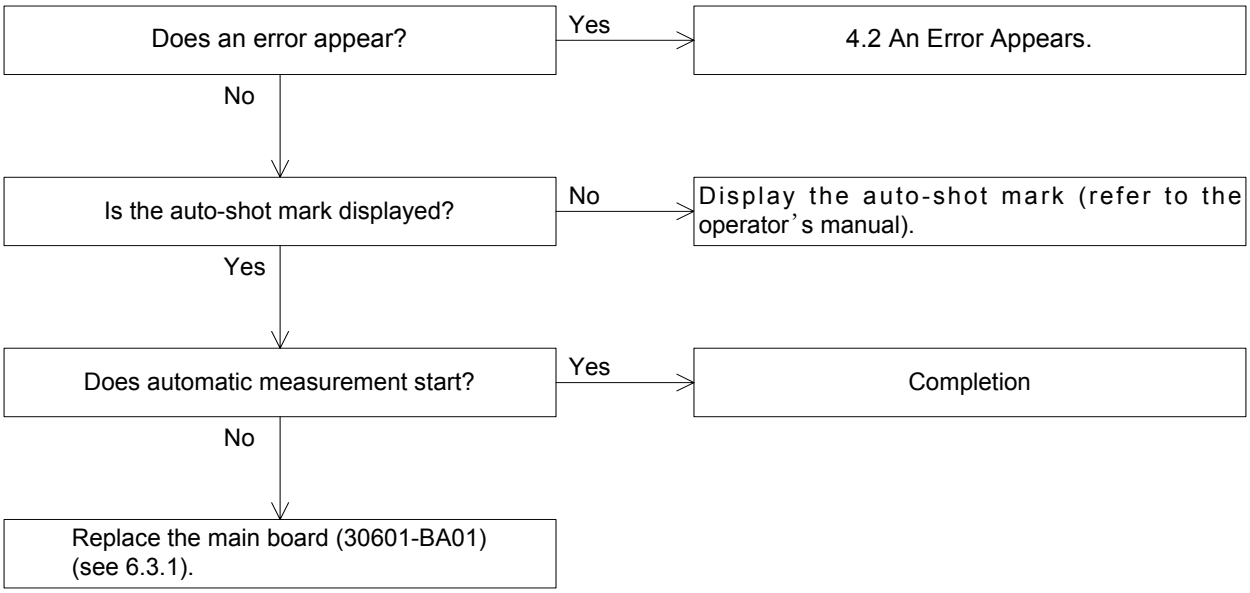
* Applicable for AR-330A, ARK-530A, AR-360A, and ARK-560A only



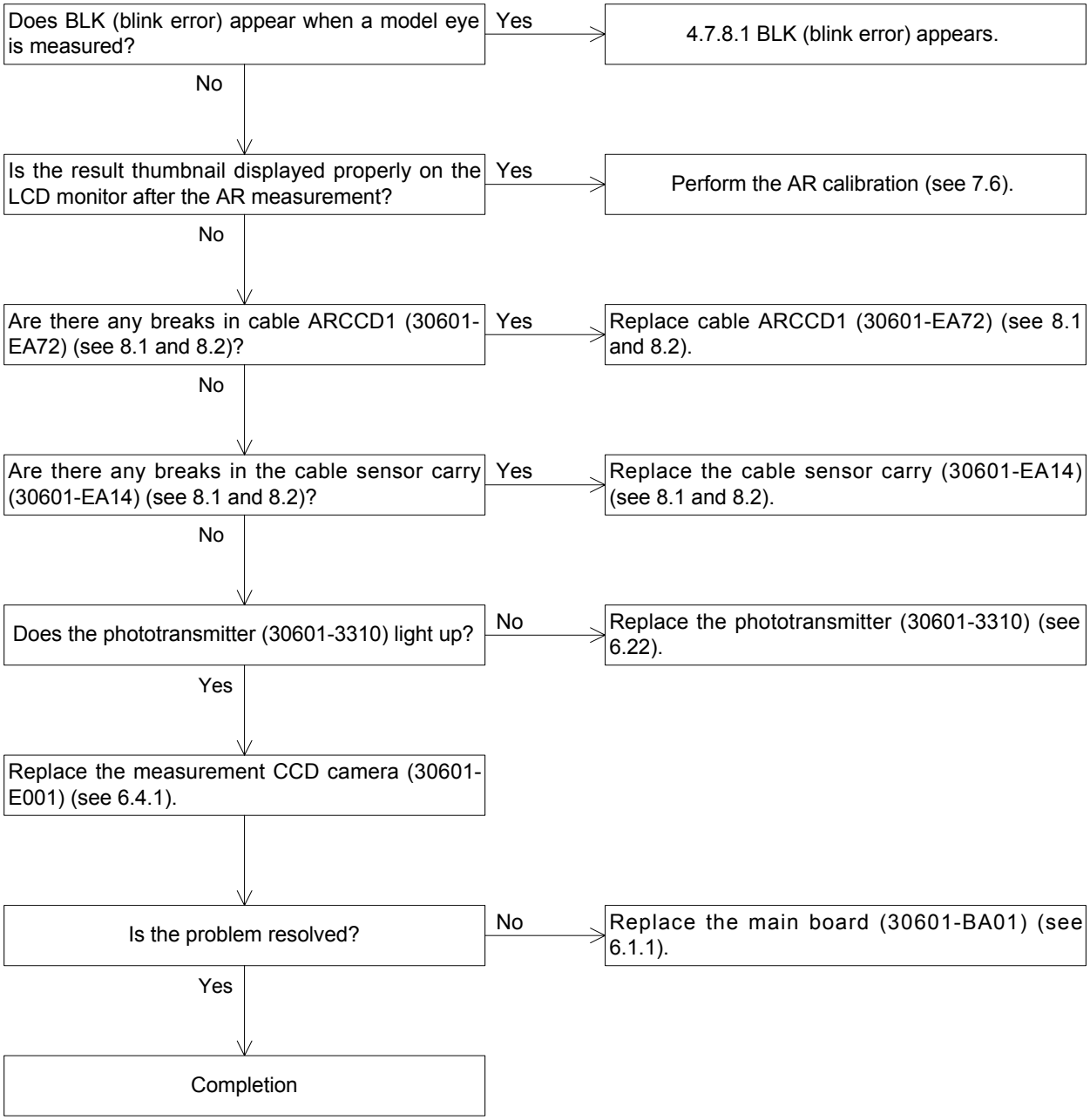
4.7.6 Measurement does not start even when Start button is pressed.



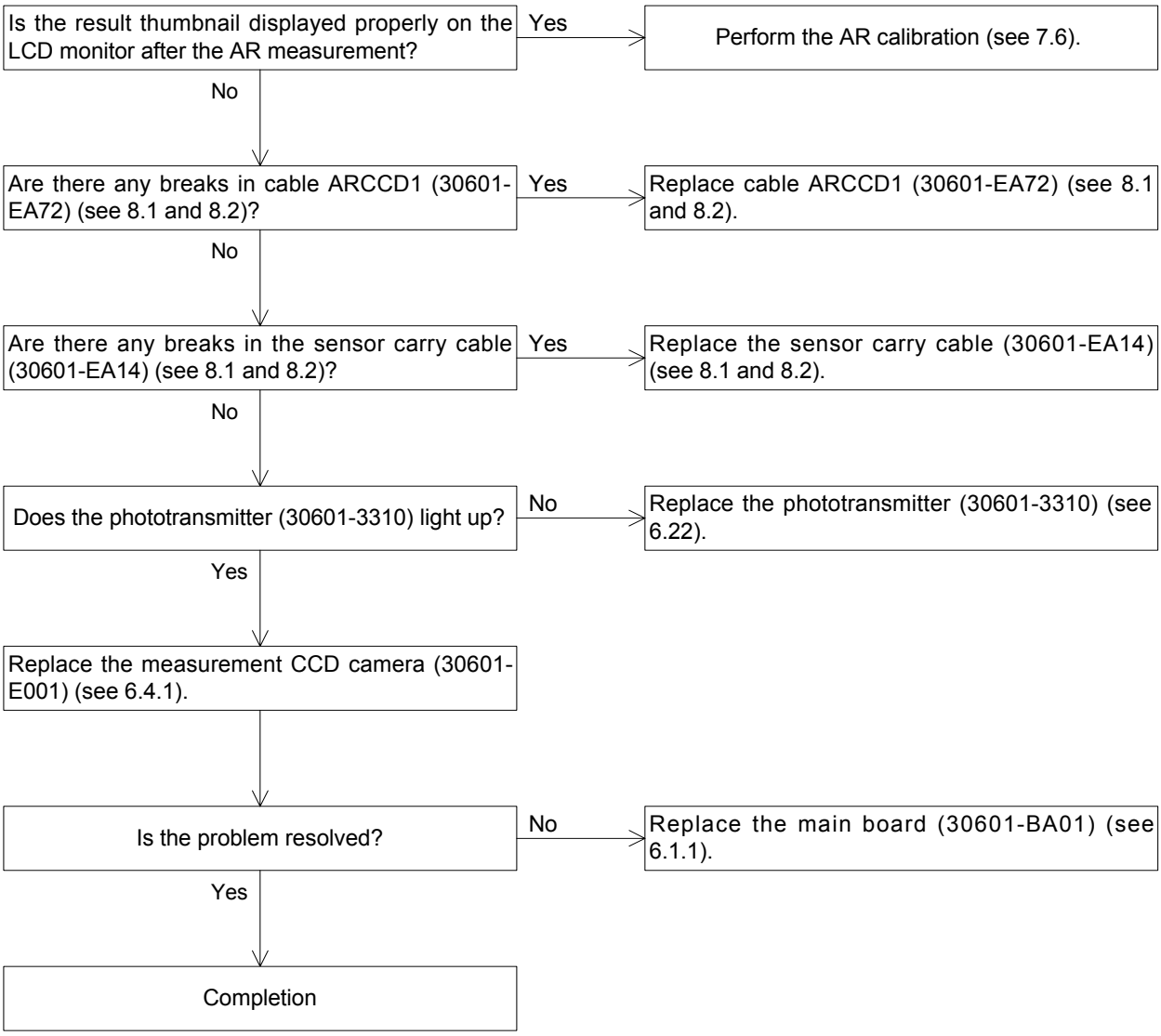
4.7.7 Measurement does not start even when alignment and focus match.



4.7.8 AR measurement data is not normal.



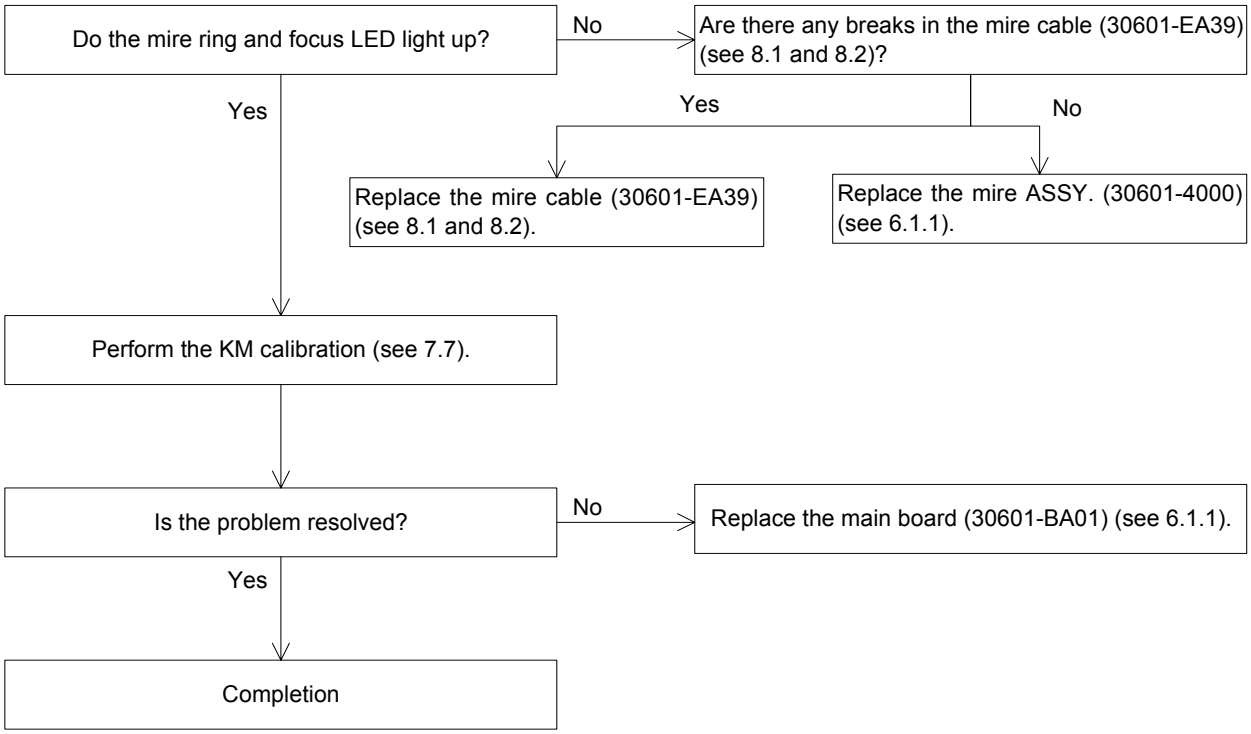
4.7.8.1 BLK (blink error) appears.



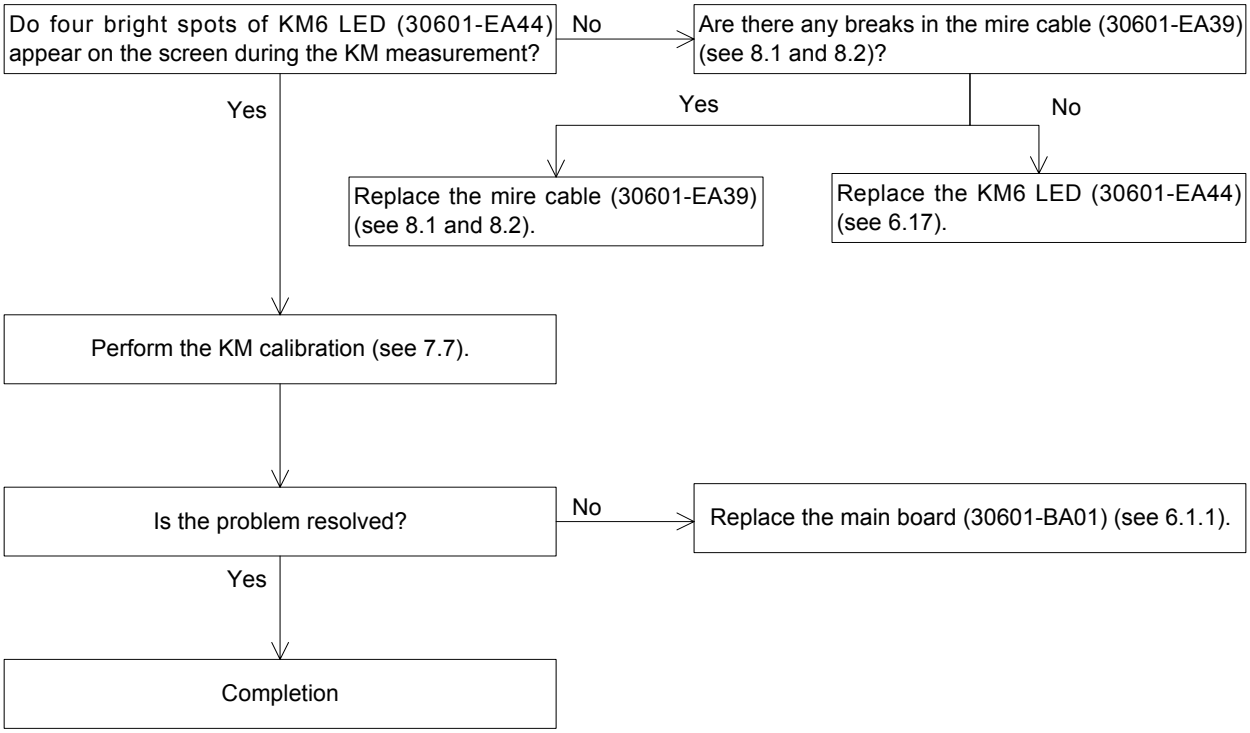
4.7.9 PD measurement data is not normal.

See “4.2.3 PD ERROR appears.”

4.7.10 KM measurement data is not normal.



4.7.11 KM periphery cannot be measured.



4.7.12 CS measurement data is not normal.

Perform the CS PS calibration (see 7.12).

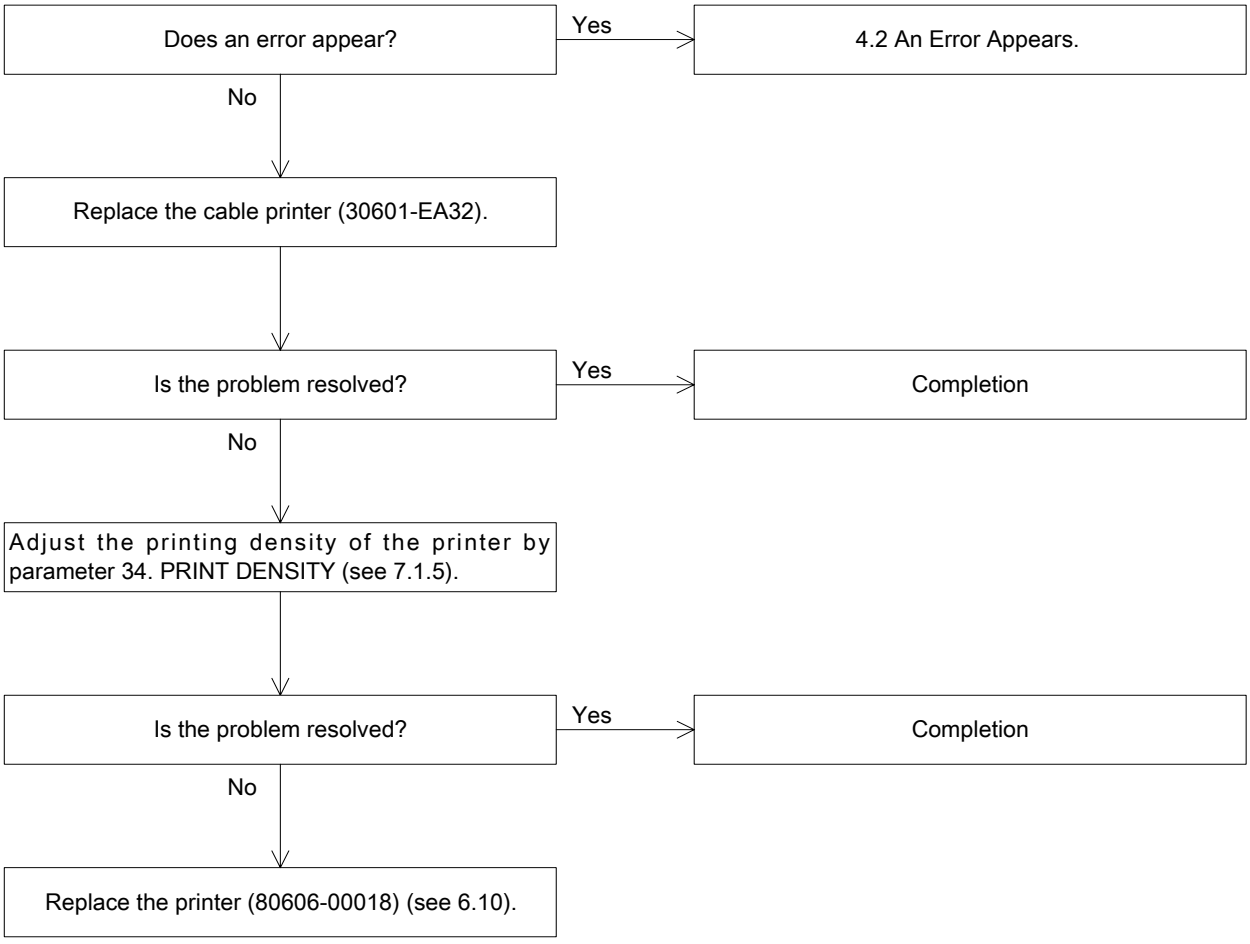
4.7.13 PS measurement data is not normal.

Perform the CS PS calibration (see 7.12).

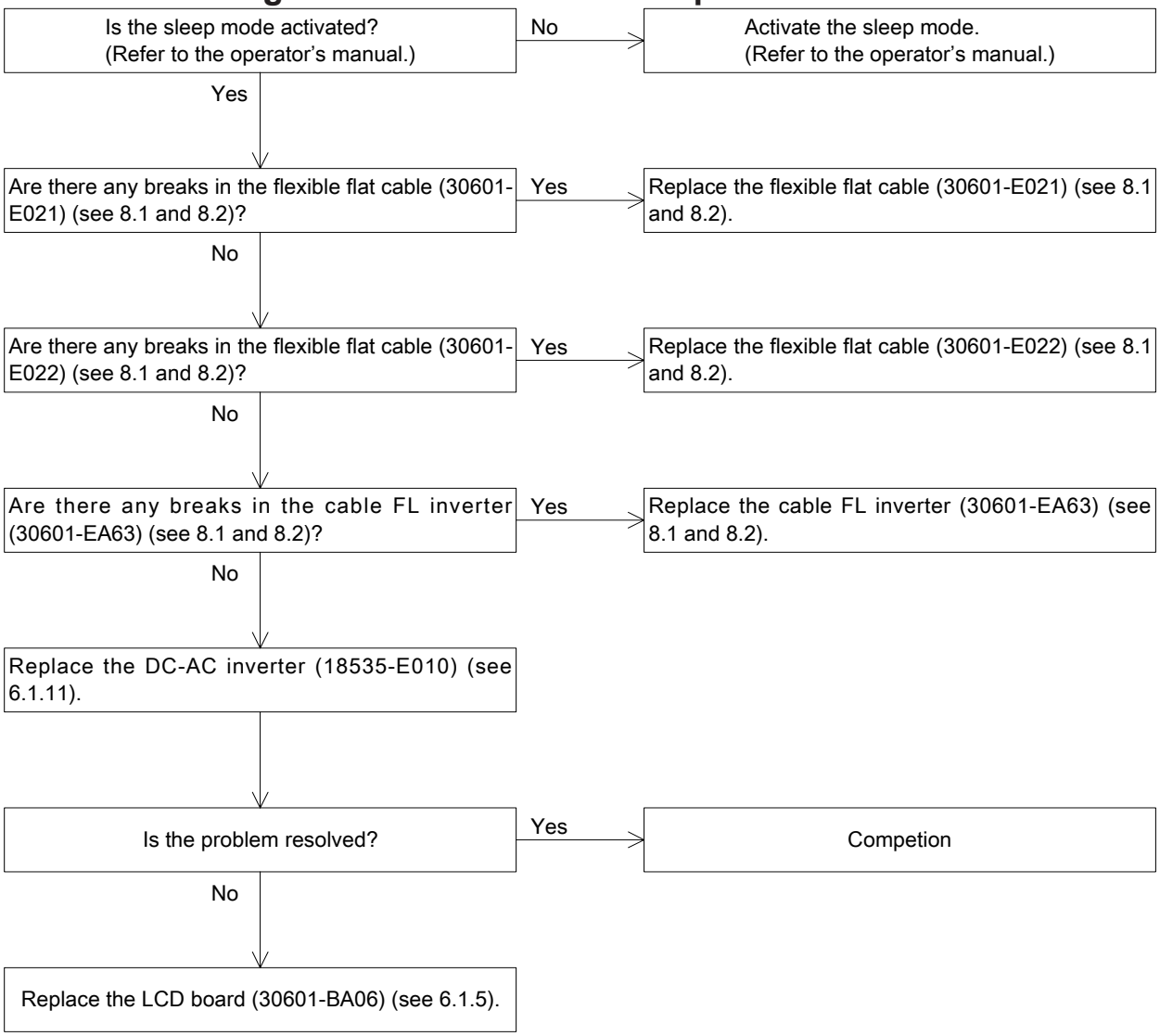
4.8 Communication cannot be Performed Properly.

Perform the procedures described in “ERR011 appears” (see 4.2.4).

4.9 Printout cannot be Performed.



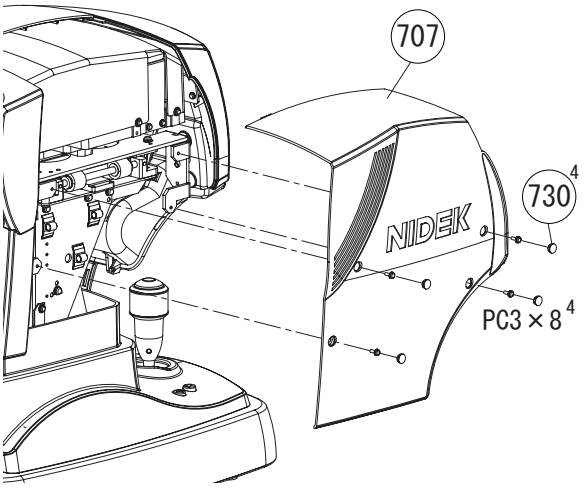
4.10 LCD Auto Light Off Function does not Operate.



§5 REMOVING PROCEDURES

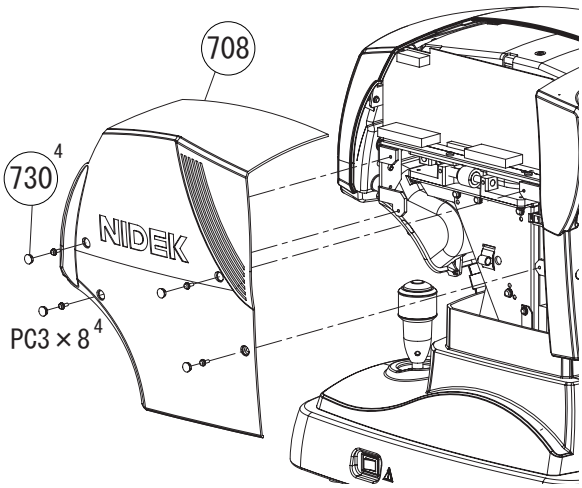
5.1 Left Cover of Measuring Unit

1. Remove the caps [32105-M730 (n = 4)].
2. Unscrew PC3 × 8 (n = 4).
3. Remove the left cover (30601-M707) of the measuring unit.
4. Reassemble the parts in reverse order.



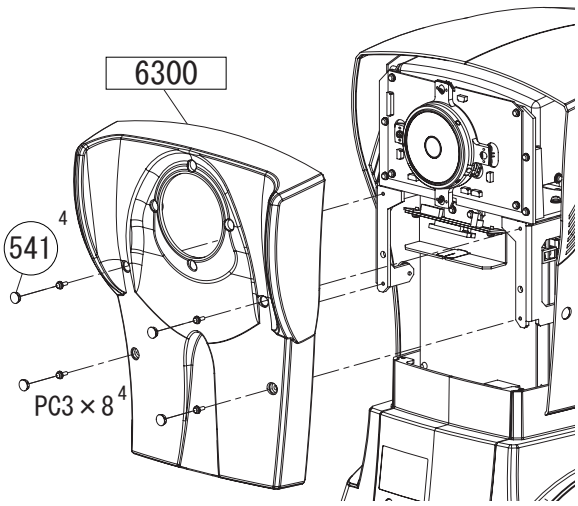
5.2 Right Cover of Measuring Unit

1. Remove the caps [32105-M730 (n = 4)].
2. Unscrew PC3 × 8 (n = 4).
3. Remove the right cover (30601-M708) of the measuring unit.
4. Reassemble the parts in reverse order.



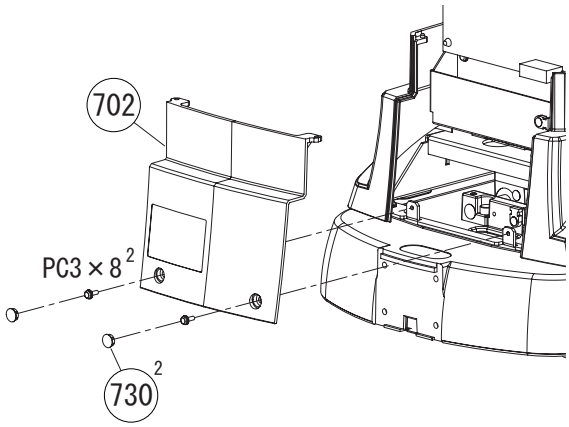
5.3 Front Cover ASSY. of Measuring Unit

1. Remove the caps [32909-M541 (n = 4)].
2. Unscrew PC3 × 8 (n = 4).
3. Remove the front cover ASSY. (30601-6300) of the measuring unit.
4. Reassemble the parts in reverse order.



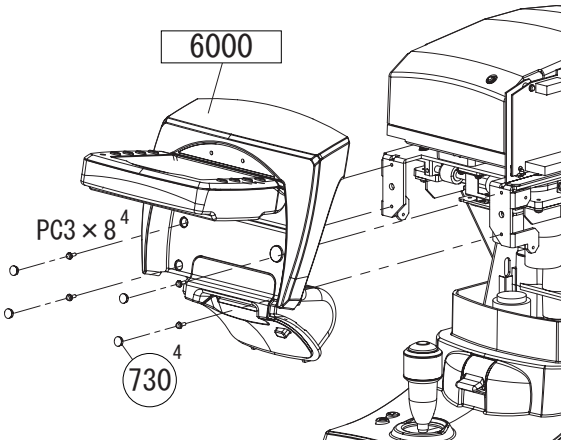
5.4 Front Body Cover

1. Remove the caps [32105-M730 (n = 4)].
2. Unscrew PC3 × 8 (n = 2).
3. Remove the front body cover (30601-M702).
4. Reassemble the parts in reverse order.



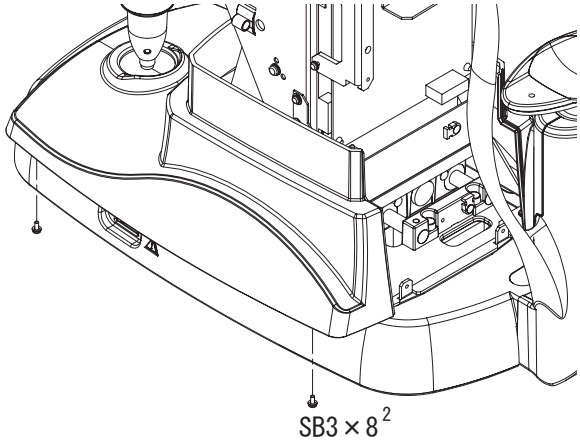
5.5 Rear Cover ASSY. of Measuring Unit

1. Remove the covers (see 5.1 and 5.2).
2. Disconnect connectors P311 (J11), P312 (J12), and P316 (J16) on the driver board (30601-BA03).
3. Disconnect connector P601 (J1) on the LCD board (30601-BA06).
4. Remove cable F.GND3 (30601-EA82).
5. Remove the caps [32105-M730 (n = 4)].
6. Unscrew PC3 × 8 (n = 4).
7. Remove the rear cover ASSY. (30601-6000) of the measuring unit.
8. Reassemble the parts in reverse order.

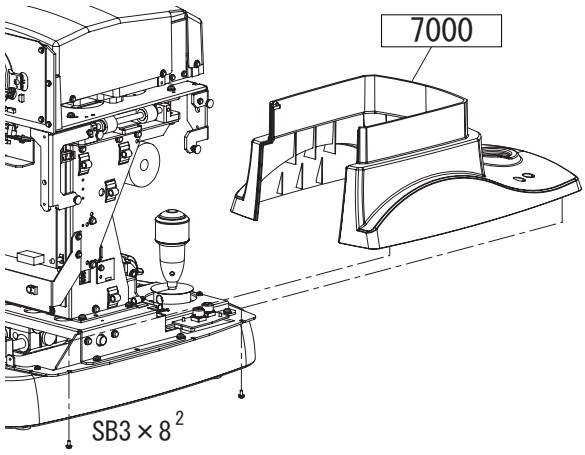


5.6 Rear Body Cover ASSY.

1. Move the measuring unit to the top position.
2. Remove the front cover ASSY. of the measuring unit, front cover of the body, and rear cover ASSY. of the measuring unit (see 5.3, 5.4 and 5.5).
3. Move the measuring unit to the right and unscrew SB3 × 8 (n = 2).

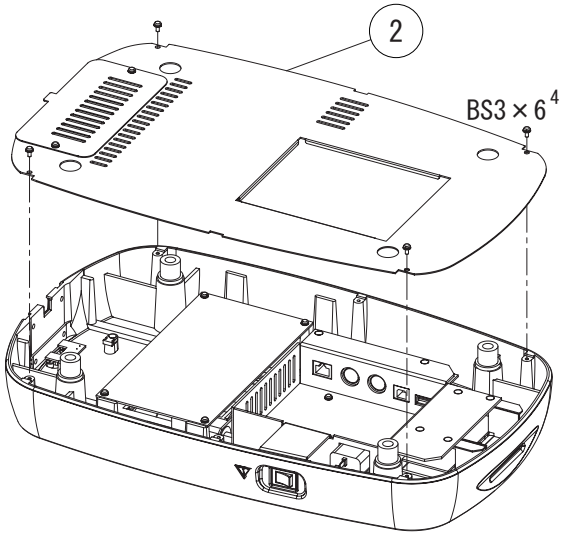


4. Move the measuring unit to the left and unscrew SB3 × 8 (n = 2).
5. Disconnect connectors P901 (J1) and P902 (J2) on the U/D SW board (30601-BA09).
6. Remove the rear body cover ASSY. (30601-7000).
7. Reassemble the parts in reverse order.



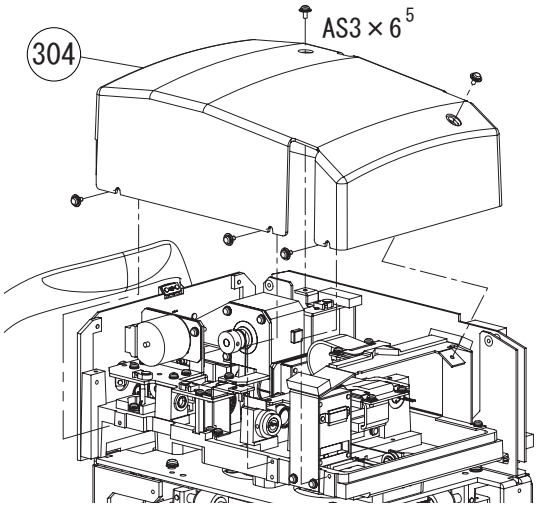
5.7 Base Plate

1. Unscrew BS3 × 6 (n = 4).
2. Remove the base plate (30601-M002).
3. Reassemble the parts in reverse order.



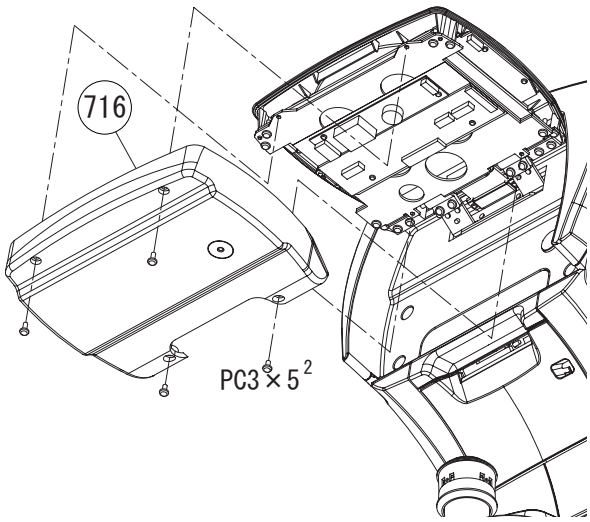
5.8 Dust Cover

1. Remove the right and left covers of the measuring unit, and the rear and front cover ASSYs of the measuring unit (see 5.1, 5.2, 5.3, and 5.5).
2. Unscrew AS3 × 6 (n = 2) on top of the dust cover (30601-M304) and loosen AS3 × 6 (n = 3) on the side of it.
3. Remove the dust cover (30601-M304).
4. Reassemble the parts in reverse order.



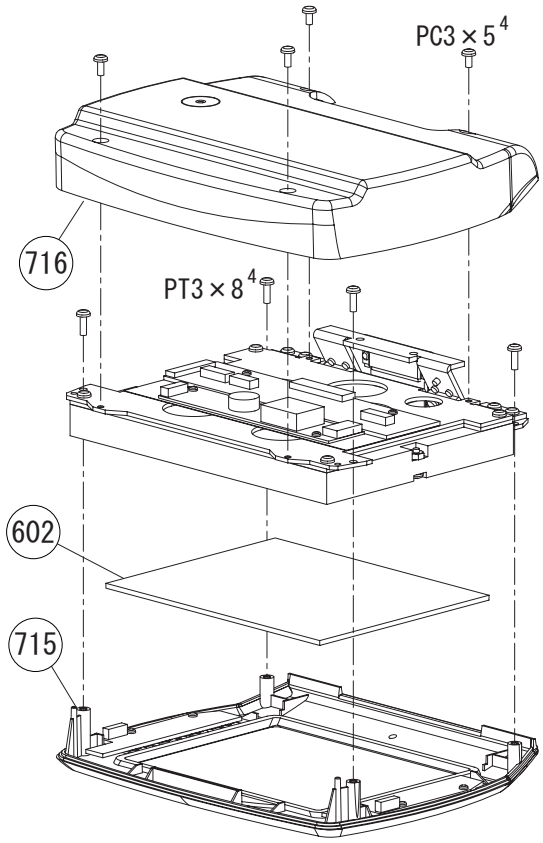
5.9 LCD Rear Cover

1. Unscrew PC3 × 5 (n = 4).
2. Remove the LCD rear cover (30601-M716).
3. Reassemble the parts in reverse order.



5.10 LCD Front Cover

1. Remove the LCD ASSY. (30601-6100) (see 6.14).
2. Unscrew PC3 × 5 (n = 4) to remove the LCD rear cover (30601-M716).
3. Disconnect connector P701 (J1) on the left panel SW board (30601-BA07) and connector P71501 (J1) on the right panel SW board (30601-BA15).
4. Unscrew PT3 × 8 (n = 4) to remove the LCD front cover (30601-M715) together with the left panel SW board (30601-BA07) and the right panel SW board (30601-BA15).
5. Remove the protective panel (30601-M602).
6. Reassemble the parts in reverse order.
7. Perform CURSOR BOARD (see 7.14).



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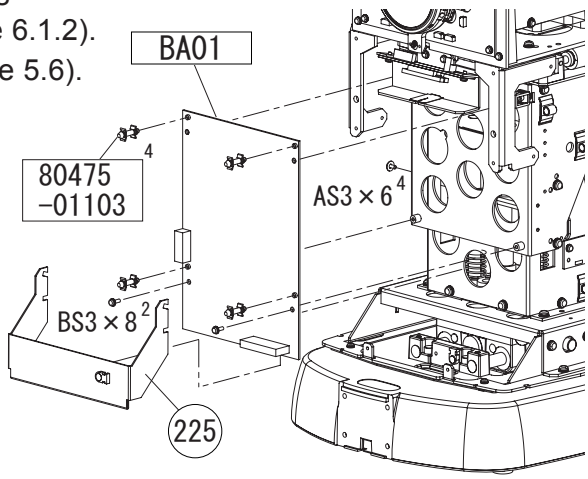
§6 REPLACEMENT PROCEDURES

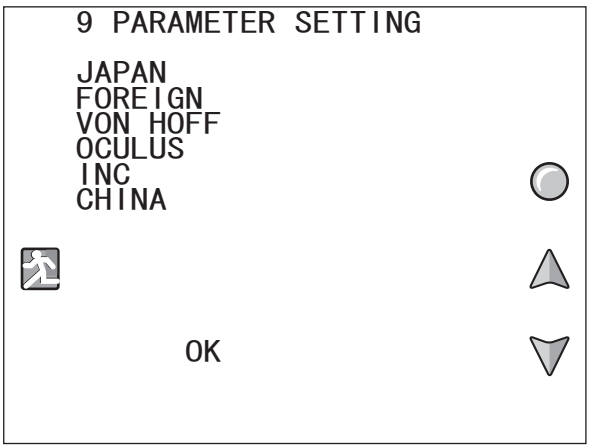
6.1 Boards

6.1.1 Main board

Replacement parts: 30601-BA01P (for the AR-310A)
: 30602-BA01P (for the AR-330A)
: 30603-BA01P (for the AR-360A)
: 30701-BA01P (for the ARK-510A)
: 30702-BA01P (for the ARK-530A)
: 30703-BA01P (for the ARK-560A)

1. Display the PARAMETER SETTING screen (see 7.1.5).
2. Press the print button to print out the setting of the device.
3. Remove the tracking board (30601-BA02) (see 6.1.2).
4. Remove the rear body cover (30601-7000) (see 5.6).
5. Unscrew AS3 × 6 (n = 4) to remove the guard (30601-M225).
6. Disconnect all the connectors on the main board (30601-BA01).
7. Unscrew BS3 × 8 (n = 2) to remove the main board (30601-BA01) together with the double locking spacers (80745-01103).
8. Remove the double locking spacers [80475-01103 (n = 4)].
9. Replace the main board (30601-BA01).
10. Reassemble the parts in reverse order.
11. After the replacement, turning on the power displays the errors below.
 1) The AR-310A, AR-330A, AR-360A: ERR065
 2) The ARK-510A, ARK-530A, ARK-560A: ERR066
 * Do not turn the power off until the errors are displayed.
 * If the replaced main board does not match to the device model, ERR062 to ERR064 occur and the device does not start.
12. Turn the power off and turn it on again.
13. Enter the MENU mode and select 9. PARAMETER SETTING (see 7.1.1).
14. Press the up or down button to select the desired destination language.
15. Press the set button and confirm that OK appears at the lower position of the screen.
16. Press the exit button twice.
17. Turn the power off and turn it on again.
18. Display the PARAMETER SETTING screen (see 7.1.5).
19. Set the parameters according to the setting of the device that was printed out (see 7.1.5).

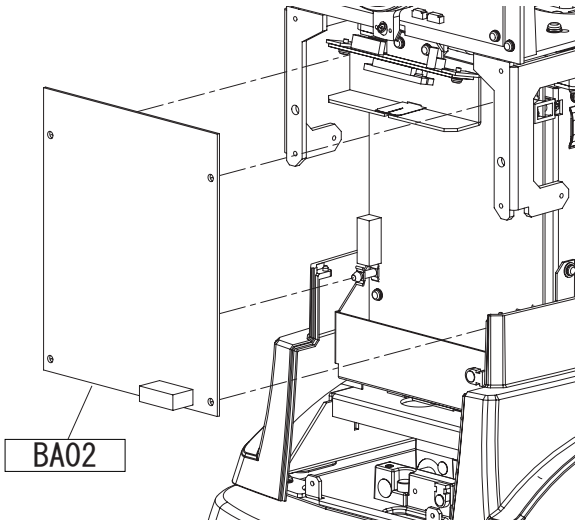




6.1.2 Tracking board

Replacement part: 30601-BA02

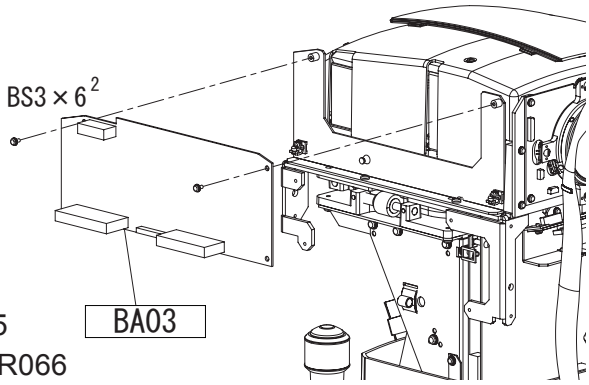
1. Remove the covers (see Chapter 5).
2. Disconnect all connectors on the tracking board (30601-BA02).
3. Replace the tracking board (30601-BA02).
4. Reassemble the parts in reverse order.



6.1.3 Driver board

Replacement part: 30601-BA03

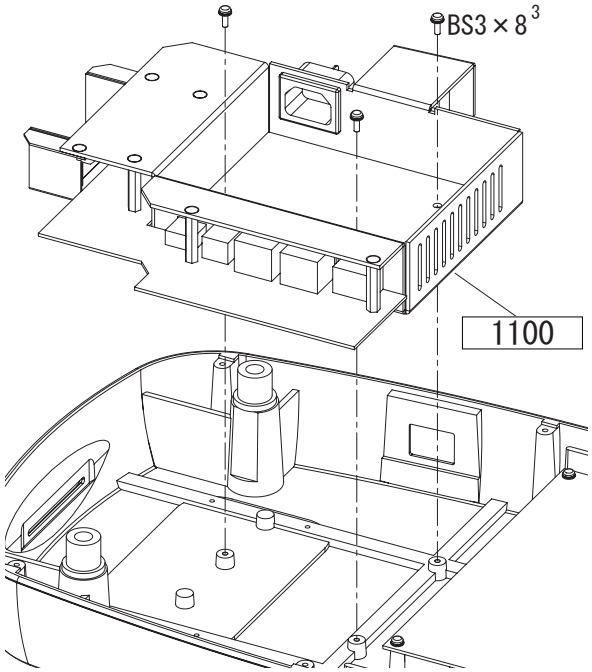
1. Remove the covers (see Chapter 5).
2. Disconnect all connectors on the driver board (30601-BA03).
3. Unscrew BS3 × 6 (n = 2).
4. Replace the driver board (30601-BA03).
5. Reassemble the parts in reverse order.
6. After the replacement, turning on the power displays the errors below.
 1) The AR-310A, AR-330A, AR-360A: ERR065
 2) The ARK-510A, ARK-530A, ARK-560A: ERR066
 * Do not turn off the power until the errors are displayed.
 * If the replaced main board does not match to the device model, ERR062 to ERR064 occur and the device does not start.
7. Turn off the power and turn it on again.
8. Rewrite the EEPROM data (see 7.13).



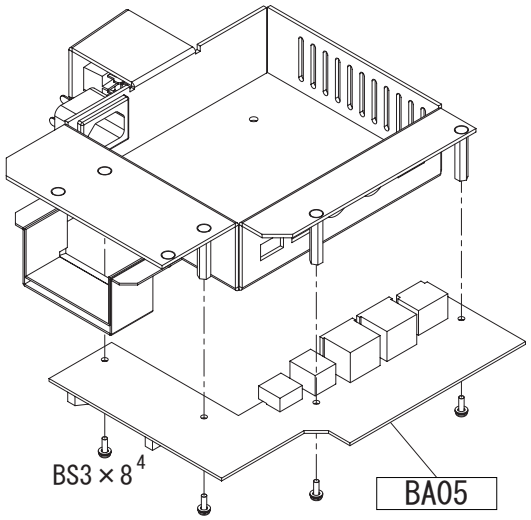
6.1.4 Base board

Replacement part: 30601-BA05

1. Remove the base plate (30601-M002) (see 5.7).
2. Disconnect all connectors on the base board (30601-BA05).
3. Unscrew BS3 × 8 (n = 3) and TW3 (n = 2), and disconnect the connector cable (30601-EA01) and the earth cable on the base board (30601-BA05).
4. Unscrew BS3 × 8 (n = 3) to remove the inlet ASSY. (30601-1100).



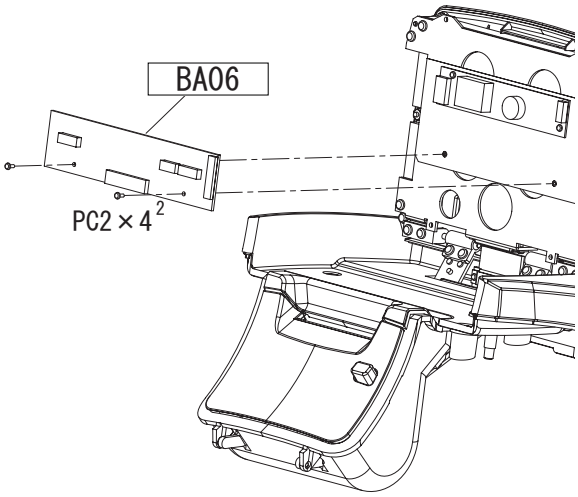
5. Unscrew BS3 × 8 (n = 4) and replace the base board (30601-BA05).
6. Reassemble the parts in reverse order.



6.1.5 LCD board

Replacement part: 30601-BA06

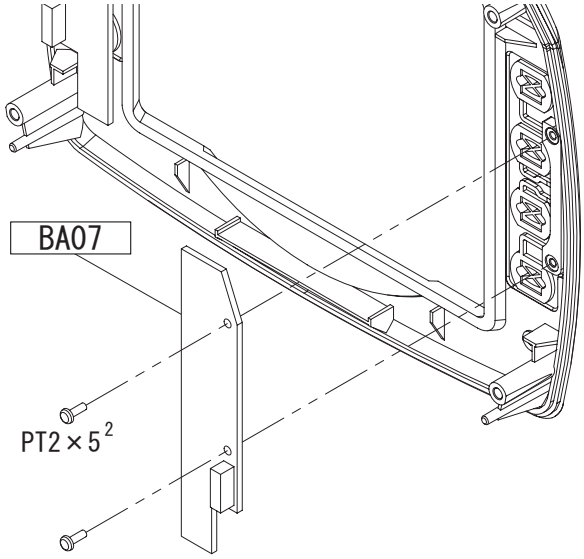
1. Open the LCD ASSY. (30601-6100) and remove the rear LCD cover (30601-M716) (see 5.9).
2. Disconnect all connectors on the LCD board (30601-BA06).
3. Unscrew PC2 × 4 (n = 2).
4. Replace the LCD board (30601-BA06).
5. Reassemble the parts in reverse order.



6.1.6 Left panel SW board

Replacement part: 30601-BA07

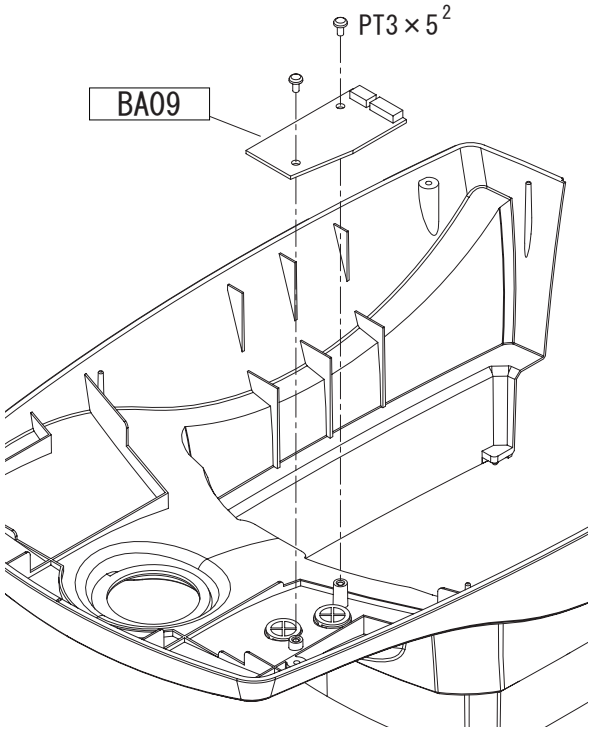
1. Remove the front LCD cover (30601-M715) (see 5.10).
2. Unscrew PT2 × 5 (n = 2) to replace the left panel SW board (30601-BA07).
3. Reassemble the parts in reverse order.



6.1.7 U/D SW board

Replacement part: 30601-BA09

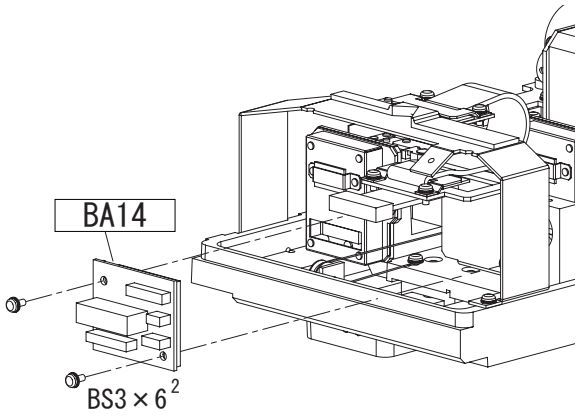
1. Remove the rear body cover ASSY. (30601-7000) (see 5.6).
2. Unscrew PT3 × 5 (n = 2).
3. Replace the U/D SW board (30601-BA09).
4. Reassemble the parts in reverse order.



6.1.8 Sensor carry board

Replacement part: 30601-BA14

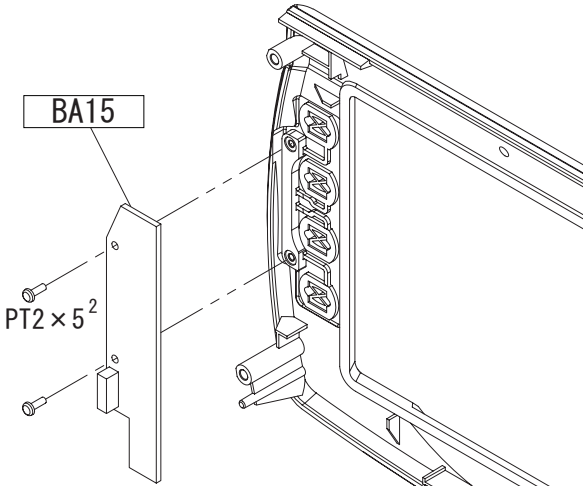
1. Remove the dust cover (see 5.8).
2. Disconnect all connectors on the sensor carry board (30601-BA14).
3. Unscrew BS3 × 6 (n = 2).
4. Replace the sensor carry board (30601-BA14).
5. Reassemble the parts in reverse order.



6.1.9 Right panel SW board

Replacement part: 30601-BA15

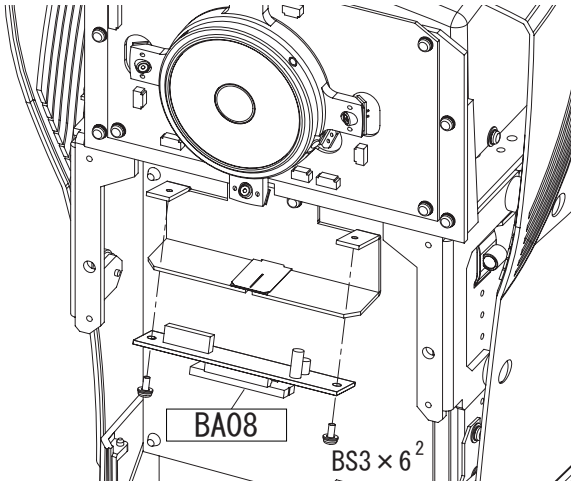
1. Remove the front LCD cover (30601-M715) (see 5.10).
2. Unscrew PT2 × 5 (n = 2) and replace the right panel SW board (30601-BA15).
3. Reassemble the parts in reverse order.



6.1.10 BA08 PD CCD board

Replacement part: 32105-BA08

1. Remove the front cover ASSY. (30601-6300) of the measurement unit (see 5.3).
2. Disconnect all connectors on the BA08 PD CCD board (32105-BA08).
3. Unscrew BS3 × 6 (n = 2).
4. Replace the BA08 PD CCD board (32105-BA08).
5. Reassemble the parts in reverse order.
6. Perform the PD calibration (see 7.8).

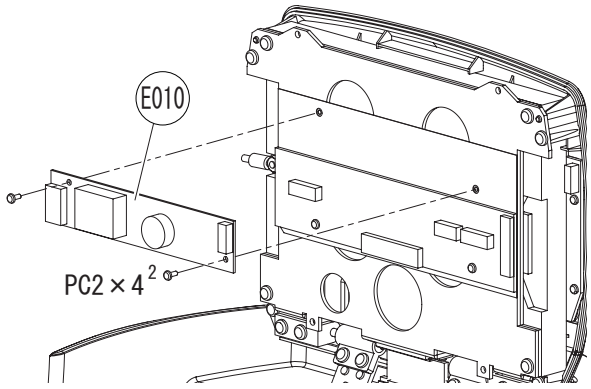


6.1.11 DC-AC inverter

Replacement part: 18535-E010

1.Open the LCD ASSY. (30601-6100) to remove the rear LCD cover (30601-M716) (see 5.9).

2. Disconnect all connectors on the DC-AC inverter (18535-E010).
3. Unscrew PC2 × 4 (n = 2) to replace the DC-AC inverter (18535-E010).
5. Reassemble the parts in reverse order.

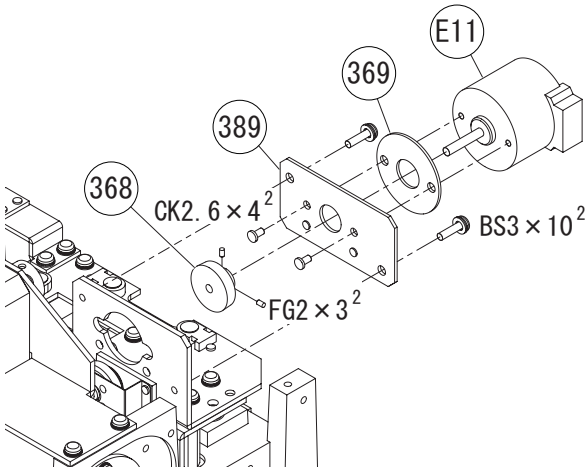


6.2 Motors

6.2.1 Brushless motor

Replacement part: 30601-E011

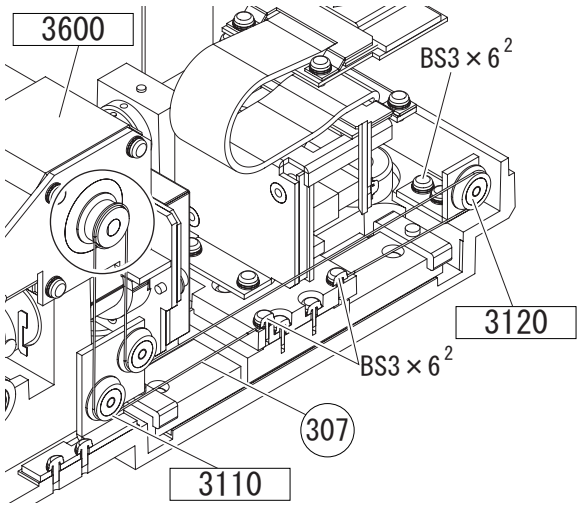
1. Remove the dust cover (30601-M304) (see 5.8).
2. Disconnect the connector of the brushless motor (30601-E011).
3. Unscrew BS3 × 10 (n = 2) to remove the brushless motor (30601-E011) together with the motor attachment plate (30601-M389).
4. Unscrew FG2 × 3 (n = 2) and remove the wheel (30601-M368).
5. Unscrew CK2.6 × 4 (n = 2) to replace the brushless motor (30601-E011).
6. Reassemble the parts in reverse order.

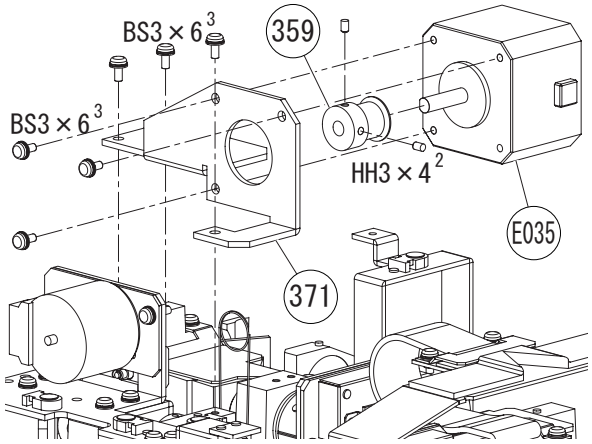


6.2.2 Sensor motor

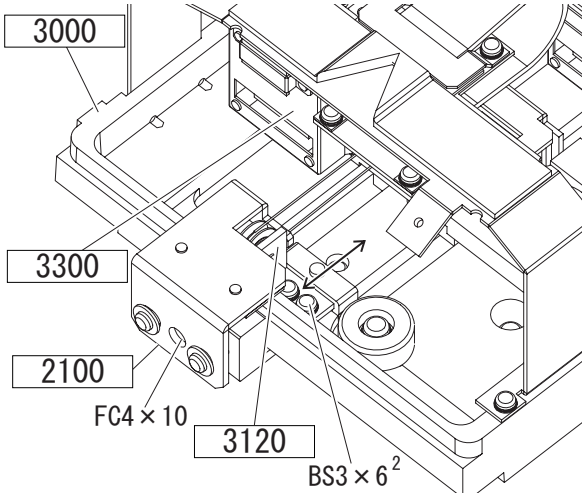
Replacement part: 30601-E035

1. Remove the dust cover (30601-M304) (see 5.8).
2. Unscrew BS3 × 6 (n = 2) to remove the pulley 2 ASSY. (30601-3120).
3. Remove the wire (30601-M307) from the pulley (30601-M359) of the motor ASSY. (30601-3600).
4. Unscrew BS3 × 6 (n = 2) to remove the sensor motor (30601-E035) together with the motor attachment plate (30601-M371).
5. Unscrew HH3 × 4 (n = 2) to remove the pulley (30601-M359).
6. Unscrew BS3 × 6 (n = 3) to replace the sensor motor (30601-E035).
7. Reassemble the parts in reverse order.
 * Wind the wire (30601-M307) around the pulley (30601-M359) of the motor ASSY. (30601-3600).
 * Loosen BS3 × 6 (n = 2) for fixing the pulley 2 ASSY. (30601-3120).





8. Attach the tension jig (30670-2100) to the measuring unit ASSY. (30601-3000).
9. Turn FC4 × 10 of the tension jig (30670-2100) to adjust the tension of the wire (30601-M307) so that the focus base ASSY. (30601-3300) moves smoothly.
10. Fix the pulley 2 ASSY. (30601-3120) with BS3 × 6 (n = 2).
11. Perform the AR calibration (see 7.6).

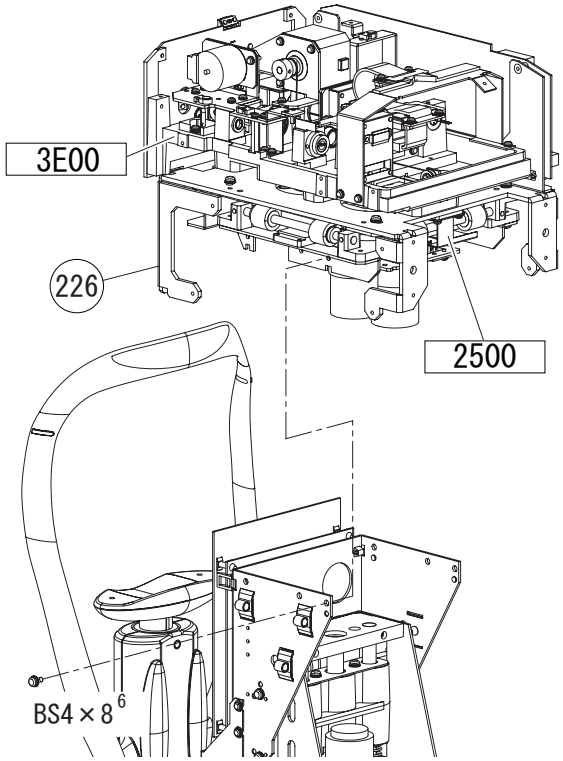


6.2.3 R/L motor

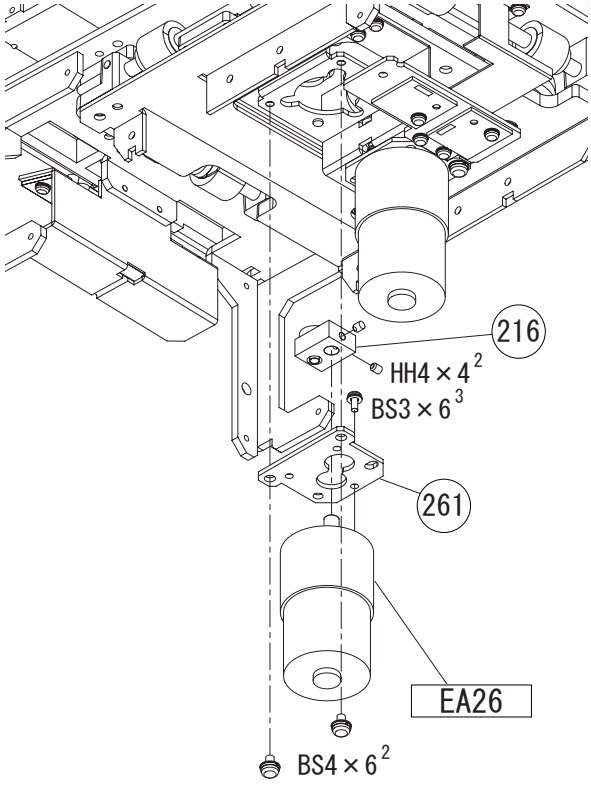
Replacement part: 30602-EA26

* Applicable for the AR-330A, AR-360A, ARK-530A, and ARK-560A

1. Remove the covers (see Chapter 5).
2. Disconnect connector P102 (J2) on the main board (30601-BA01), connectors P201 (J1), P205 (J5), P208 (J8), P211 (J11) and the earth cable on the tracking board (30601-BA02).
3. Unscrew BS4 × 8 (n = 6) to remove the tracking horizontal ASSY. (30601-2500) and measuring unit (30601-3E00) together with the attachment plate (30601-M226).



4. Unscrew BS4 × 6 (n = 2) to remove the R/L motor (30602-EA26) together with the attachment plate (30602-M261).
5. Unscrew HH4 × 4 (n = 2) to remove the holder bearing (32164-M216).
6. Unscrew BS3 × 6 (n = 3) to remove the attachment plate (30602-M261).
7. Replace the R/L motor (30602-EA26).
8. Reassemble the parts in reverse order.
9. Perform AUTO TRC ADJUST (see 7.10).

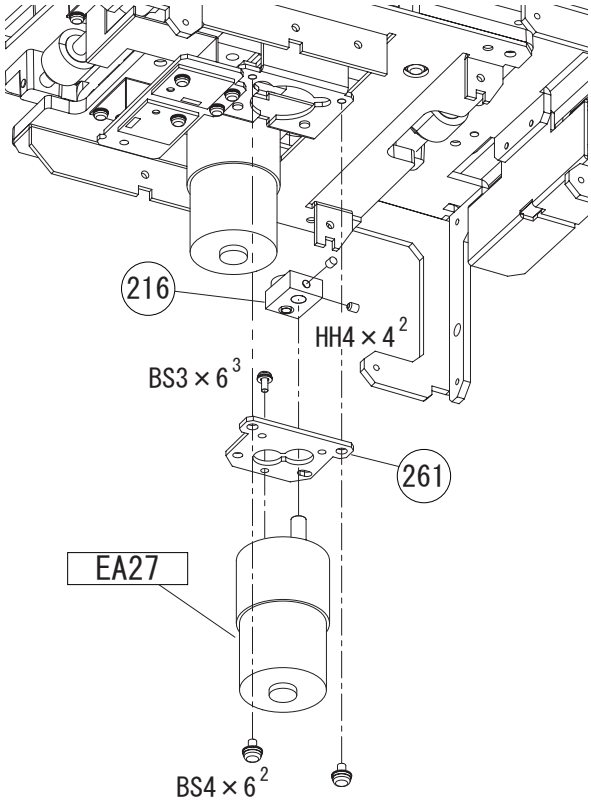


6.2.4 F/B motor

Replacement part: 30602-EA27

* Applicable for the AR-330A, AR-360A, ARK-530A, and ARK-560A only

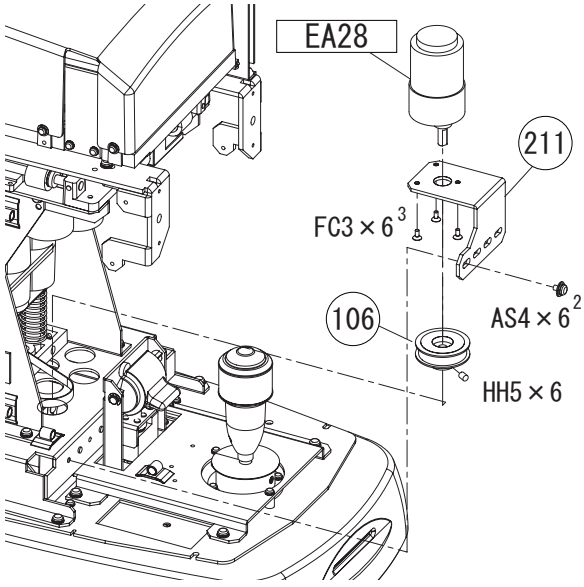
1. Remove the covers (see Chapter 5).
2. Remove the measuring unit together with the tracking horizontal ASSY. (30601-2500) (see 6.2.3).
3. Unscrew BS4 × 6 (n = 2) to remove the R/L motor (30602-EA27) together with the attachment plate (30602-M261).
4. Unscrew HH4 × 4 (n = 2) to remove the holder bearing (32164-M216).
5. Unscrew BS3 × 6 (n = 3) to remove the attachment plate (30602-M261).
6. Replace the F/B motor (30602-EA27).
7. Reassemble the parts in reverse order.
8. Perform AUTO TRC ADJUST (see 7.10).



6.2.5 U/D motor

Replacement part: 30601-EA28

1. Remove the covers (see Chapter 5).
2. Unscrew AS4 × 6 (n = 2).
3. Unscrew HH5 × 6 to remove the pulley (32907-M106).
4. Unscrew FC3 × 6 (n = 3) to remove the bracket (30601-M211).
5. Replace the U/D motor (30601-EA28).
6. Reassemble the parts in reverse order.
7. Adjust the position of the bracket (30601-M211) so that the belt bends approximately 3 - 4mm when lightly pressed by hand.
 * Adjust the tension of the belt (32156-M098) so that the tension after the replacement becomes almost the same as before.
8. Perform AUTO TRC ADJUST (see 7.10).



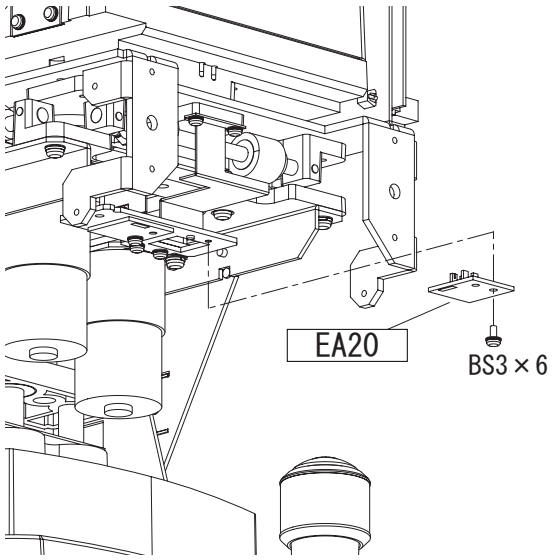
6.3 Sensors

6.3.1 R/L sensor

Replacement part: 30602-EA20

* Applicable for the AR-330A, AR-360A, ARK-530A, and ARK-560A

1. Remove the covers (see Chapter 5).
2. Unscrew BS3 × 6 to replace the R/L sensor (30602-EA20).
3. Reassemble the parts in reverse order.

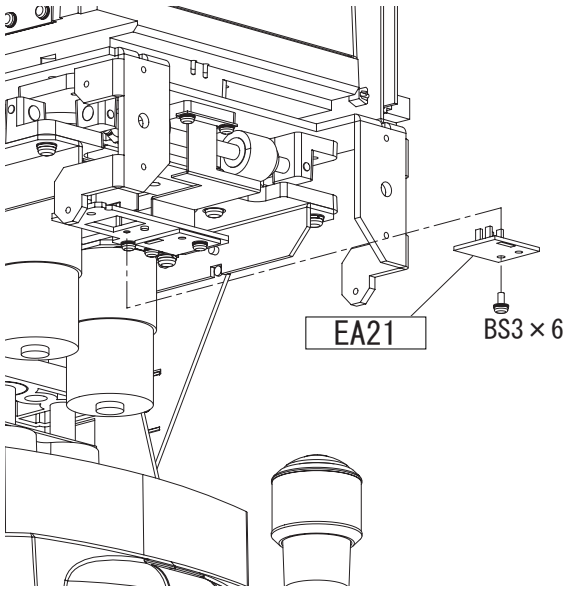


6.3.2 F/B sensor

Replacement part: 30602-EA21

* Applicable for the AR-330A, AR-360A, ARK-530A, and ARK-560A

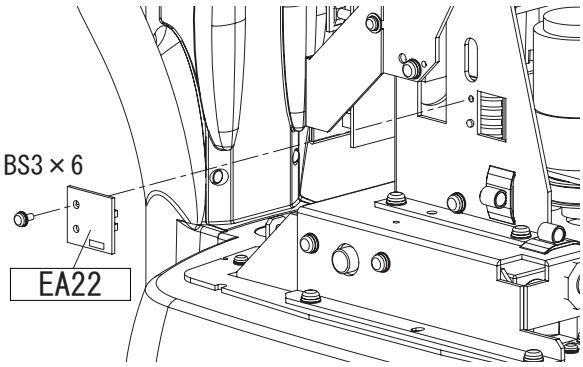
1. Remove the covers (see Chapter 5).
2. Unscrew BS3 × 6 to replace the F/B sensor (30602-EA21).
3. Reassemble the parts in reverse order.



6.3.3 U/D sensor

Replacement part: 30601-EA22

1. Remove the covers (see Chapter 5).
2. Unscrew BS3 × 6 to replace the U/D sensor (30601-EA22).
3. Reassemble the parts in reverse order.

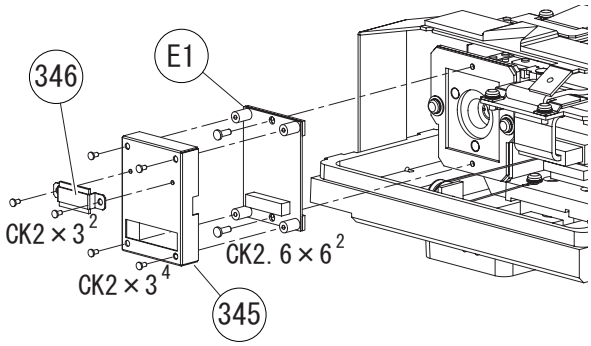


6.4 B/W CCD Camera

6.4.1 Measurement CCD camera

Replacement part: 30601-E001

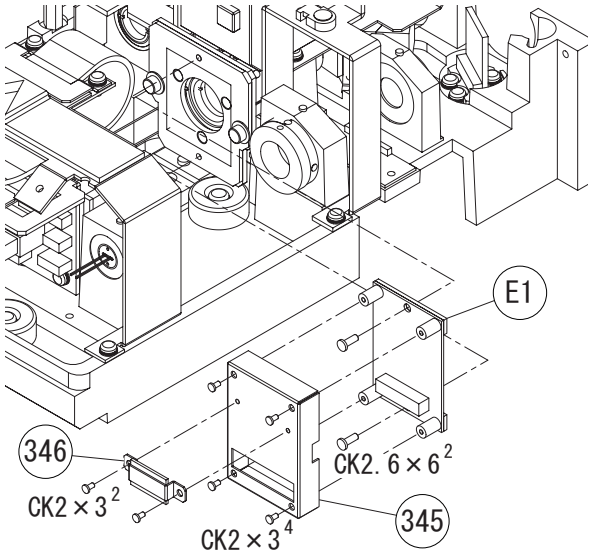
1. Remove the covers (see Chapter 5).
2. Unscrew CK2 × 3 (n = 4) to remove the code retainer (30601-M346).
3. Disconnect the connector on the B/W CCD camera (30601-E001).
4. Unscrew CK2 × 3 (n = 4) to remove the CCD cover (30601-M345).
5. Unscrew CK2.6 × 6 (n = 2) to replace the B/W CCD camera (30601-E001).
6. Reassemble the parts in reverse order.
7. Adjust the measurement CCD camera (see 7.2.2).



6.4.2 Observation CCD camera

Replacement part: 30601-E001

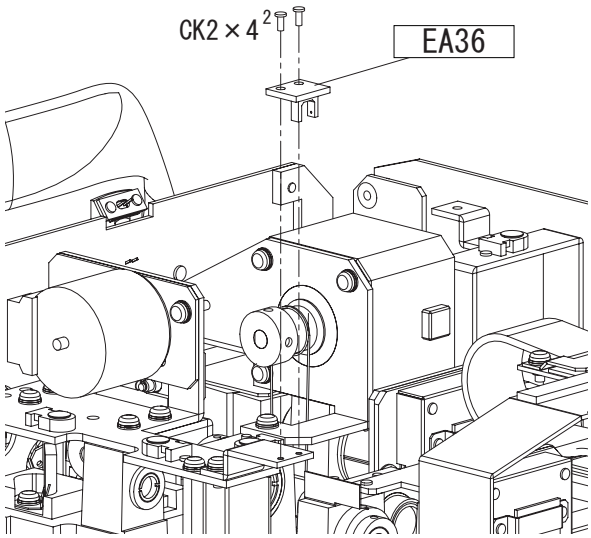
1. Remove the covers (see Chapter 5).
2. Unscrew CK2 × 3 (n = 4) to remove the code retainer (30601-M346).
3. Disconnect the connector on the B/W CCD camera (30601-E001).
4. Unscrew CK2 × 3 (n = 4) to remove the CCD cover (30601-M345).
5. Unscrew CK2.6 × 6 (n = 2) to replace the B/W CCD camera (30601-E001).
6. Reassemble the parts in reverse order.
7. Adjust the observation CCD camera (see 7.2.1).



6.5 Origin Sensor

Replacement part: 30601-EA36

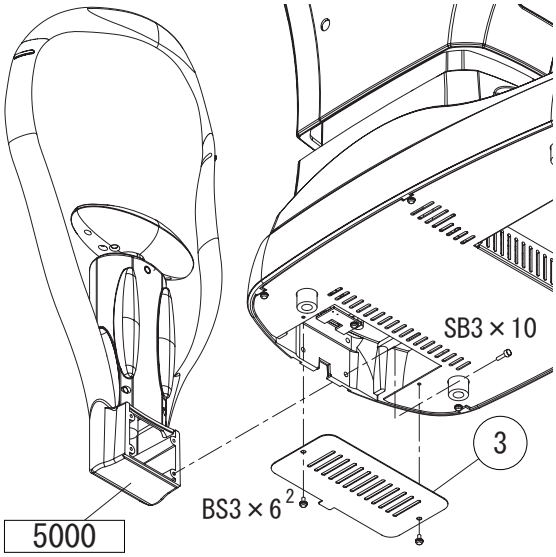
1. Remove the covers (see Chapter 5).
2. Unscrew CK 2 × 4 (n = 2) to replace the origin sensor (30601-EA36).
3. Reassemble the parts in reverse order.
4. Perform the chart calibration (see 7.6.5).
5. Perform the AR calibration (see 7.6).



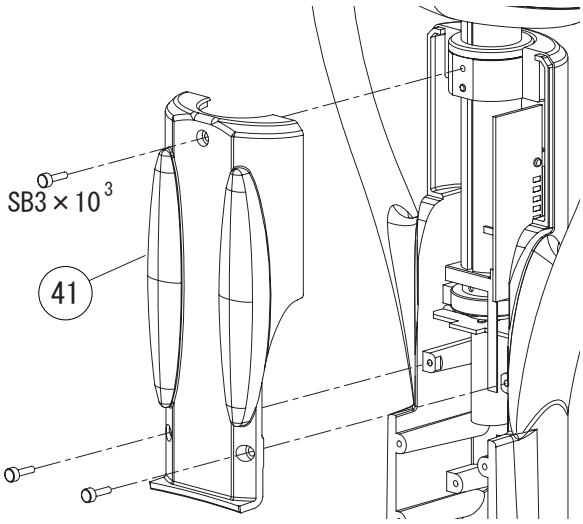
6.6 Chinrest

Replacement part: 30601-EA53

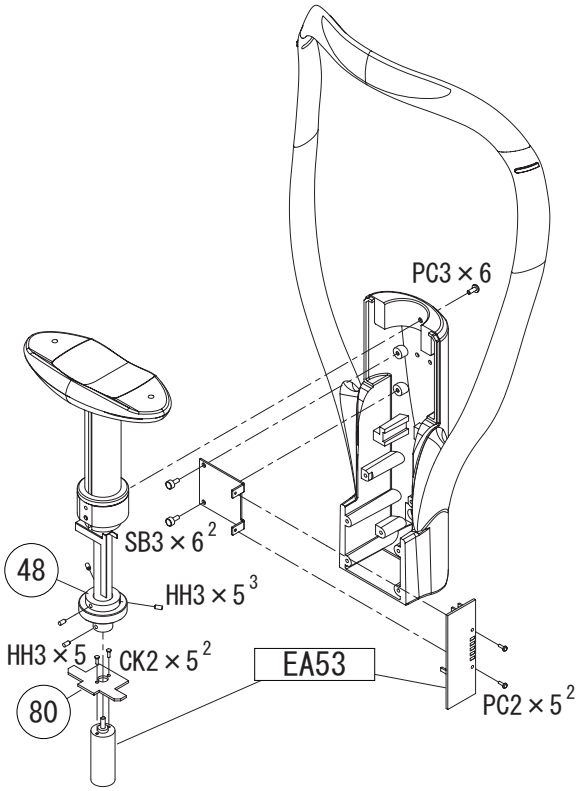
1. Unscrew BS 3 × 6 (n = 2) to remove the lid (30601-M003).
2. Disconnect connector P004 (J004).
3. Unscrew SB3 × 10 to remove the chinrest ASSY. (30601-5000).



4. Unscrew SB3 × 10 (n = 3) to remove the chinrest cover (32105-M041).



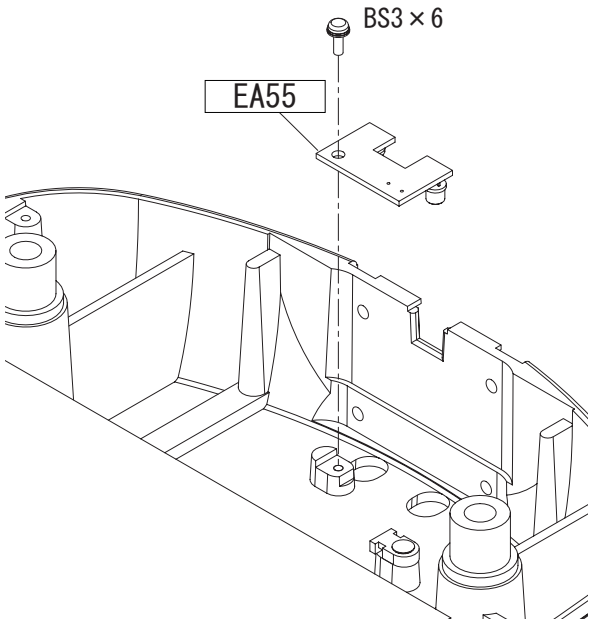
5. Unscrew PC3 × 6.
6. Unscrew HH3 × 5 (n = 3) and move the bearing (32105-M048) upward.
7. Unscrew HH3 × 5 and CK 2 × 5 (n = 2) to remove the motor brace (32105-M080).
8. Unscrew SB3 × 6 (n = 2) and PC2 × 5 (n = 2).
9. Replace the chinrest (30601-EA53).
10. Reassemble the parts in reverse order.



6.7 PD LED

Replacement part: 30601-EA55

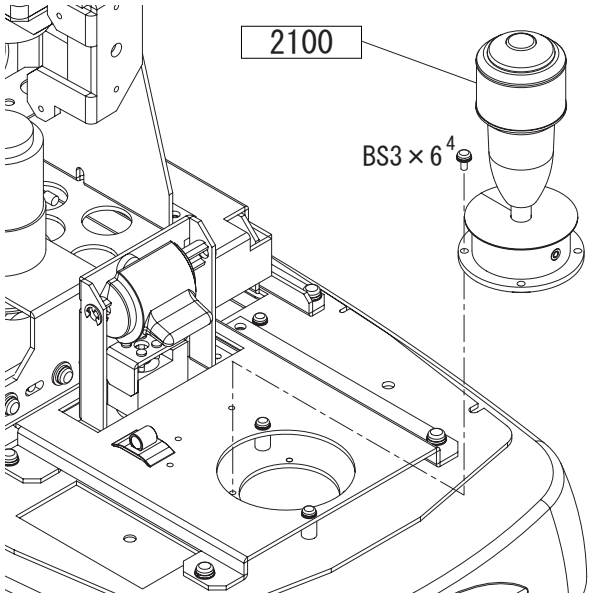
1. Remove the base plate (30601-M002) (see 5.7).
2. Disconnect connector P505 (J5) on the base board (30601-BA05).
3. Unscrew BS3 × 6 to replace PD LED (30601-EA55).
4. Reassemble the parts in reverse order.
5. Perform the PD calibration (see 7.8).



6.8 Joystick ASSY.

Replacement part: 30601-2100

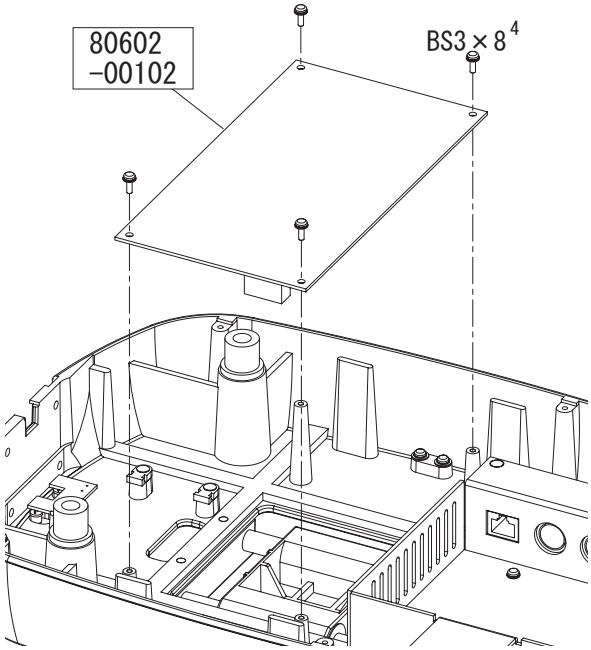
1. Remove the covers (see Chapter 5).
2. Disconnect the GND cable of the joystick.
3. Unscrew BS3 × 6 (n = 4) to replace the joystick ASSY. (30601-2100).
4. Reassemble the parts in reverse order.



6.9 Switching Regulator

Replacement part: 80602-00102

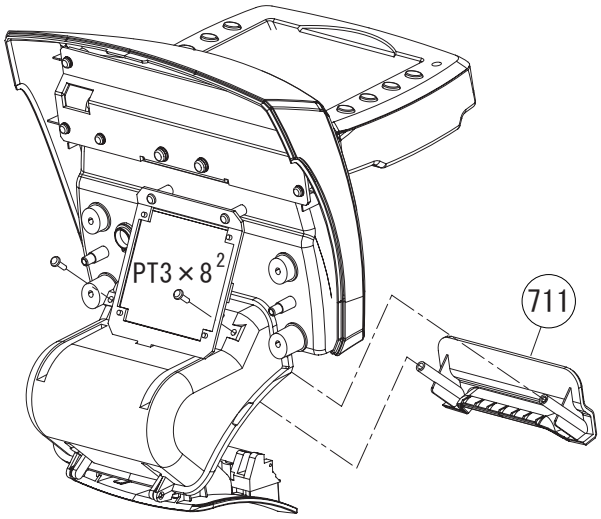
1. Remove the base plate (30601-M002) (see 5.7).
2. Unscrew BS3 × 8 (n = 4) to replace the switching regulator (80602-00102).
3. Reassemble the parts in reverse order.



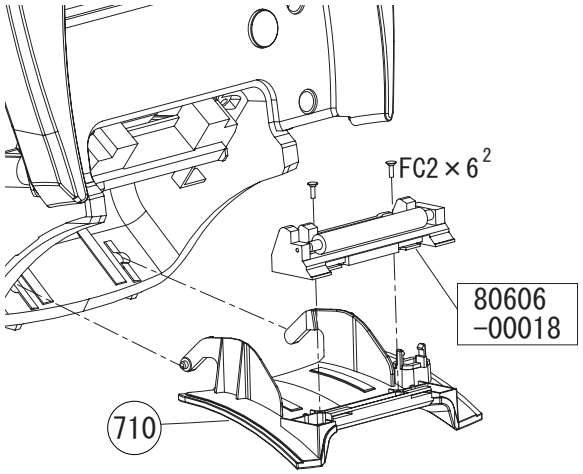
6.10 Printer

Replacement part: 80606-00018

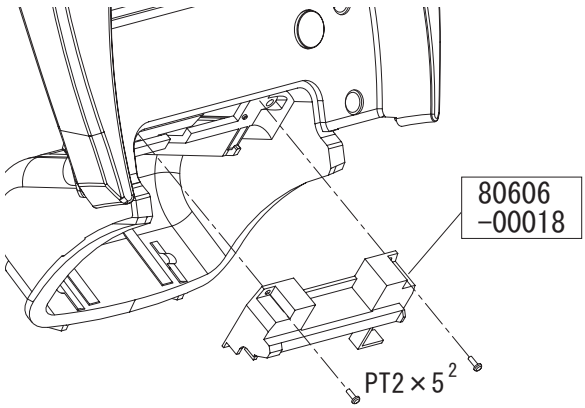
1. Remove the rear cover (30601-6000) of the measuring unit (see 5.5).
2. Unscrew PT3 × 8 (n = 2) to remove the printer fixing cover (30601-M711).



3. Remove the printer door cover (30601-M710).
4. Unscrew FT2 × 6 (n = 2) to replace the printer (80606-00018).



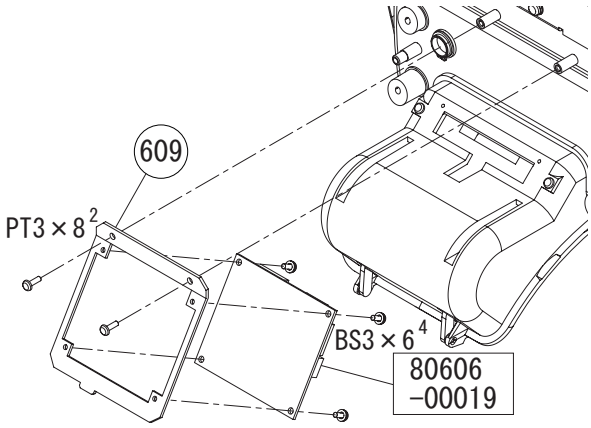
5. Unscrew PT2 × 5 (n = 2) to replace the printer (80606-00018).
6. Reassemble the parts in reverse order.



6.11 Printer Interface Board

Replacement part: 80606-00019

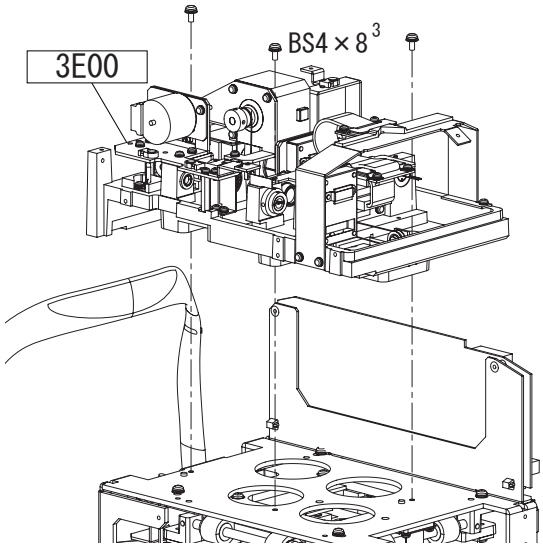
1. Remove the rear cover ASSY. (30601-6000) of the measurement unit (see 5.5).
2. Unscrew PT3 × 8 (n = 2) to remove the printer interface board (80606-00019) together with the attachment plate and PR board (30601-M609).
3. Unscrew BS3 × 6 (n = 4) to remove the attachment plate and the PR board (30601-M609).
4. Replace the printer interface board (80606-00019).
5. Reassemble the parts in reverse order.



6.12 Measuring Unit ASSY.

Replacement part: 30601-3E00

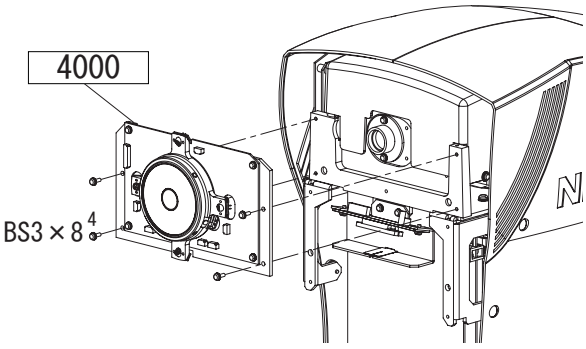
1. Remove the covers (see Chapter 5).
2. Remove the mire ASSY. (see 6.13).
3. Disconnect connector P105 (J5) on the main board (30601-BA01), connectors P304 (J4), P305 (J5), P306 (J6), P315 (J15), and the earth cable on the driver board (30601-BA01).
4. Unscrew BS4 × 8 (n = 3) to remove the measuring unit ASSY. (30601-3E00).
5. Reassemble the parts in reverse order.
6. Perform the alignment calibration (see 7.5).
7. Perform the AR calibration (see 7.6).
8. Perform the KM calibration (see 7.7).
 * The KM calibration should be performed for the ARK-560A, ARK-530A, and ARK-510A only.
9. Perform the PD calibration (see 7.8).
10. Perform the CS and PS calibrations (see 7.12).
 * The CS and PS calibrations should be performed for the ARK-560A, ARK-530A, and ARK-510A only.



6.13 Mire ASSY.

Replacement part: 30601-4000

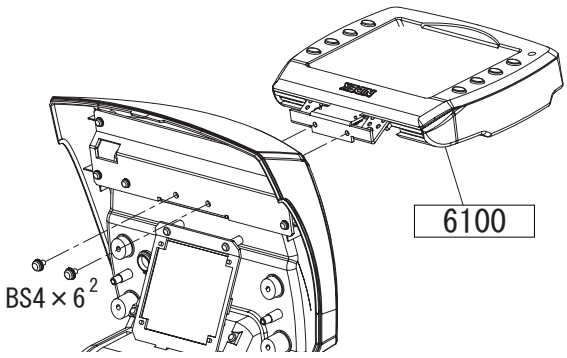
1. Remove the covers (see Chapter 5).
2. Disconnect connector P401 (J1) on the mire board (30601-BA04).
3. Unscrew BS3 × 8 (n = 4).
4. Replace the mire ASSY. (30601-4000).
5. Reassemble the parts in reverse order.
6. Perform the alignment calibration (see 7.5).
7. Perform the KM calibration (see 7.7).
 * The KM calibration should be performed for the ARK-560A, ARK-530A and ARK-510A only .



6.14 LCD ASSY.

Replacement part: 30601-6100

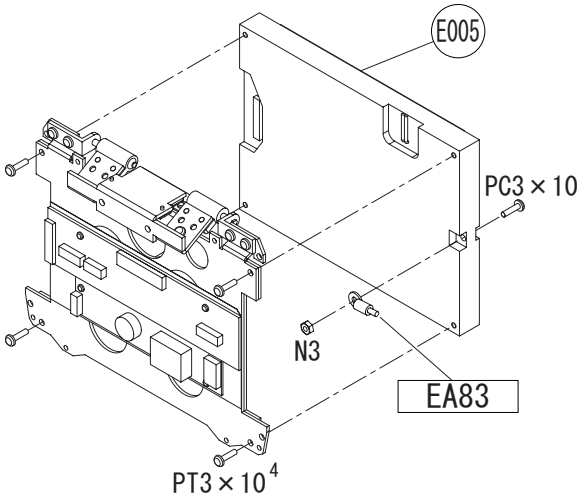
1. Remove the rear cover ASSY. (30601-6000) of the measuring unit (see 5.5).
2. Unscrew BS4 × 6 (n = 2) to replace the LCD ASSY. (30601-6100).
3. Reassemble the parts in reverse order.



6.15 Color LCD

Replacement part: 30601-E005

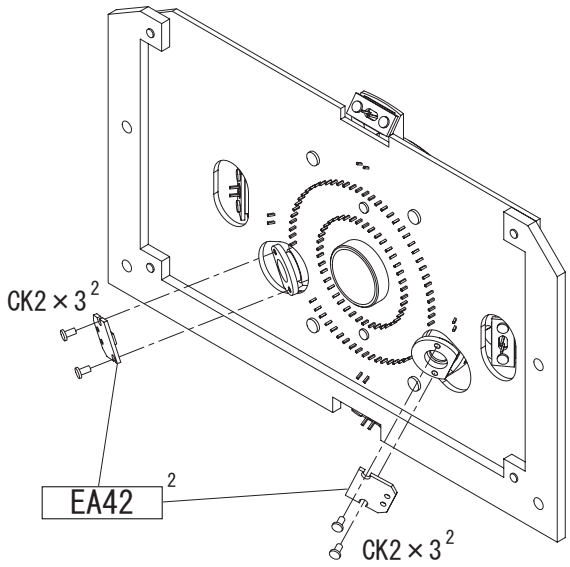
1. Remove the LCD front cover (30601-M715) (see 5.10).
2. Disconnect connector P001 (CN1) on the color LCD (30601-E005).
3. Disconnect connector P002 (CN2) on the DC-AC inverter (18535-E010).
4. Unscrew PC3 × 10 and N3, and disconnect the F.GND cable (30601-EA83).
5. Unscrew PT3 × 10 (n = 4) to replace the color LCD (30601-E005).
6. Reassemble the parts in reverse order.
7. Perform CURSOR BOARD (see 7.14).



6.16 Focus LED

Replacement part: 30601-EA42

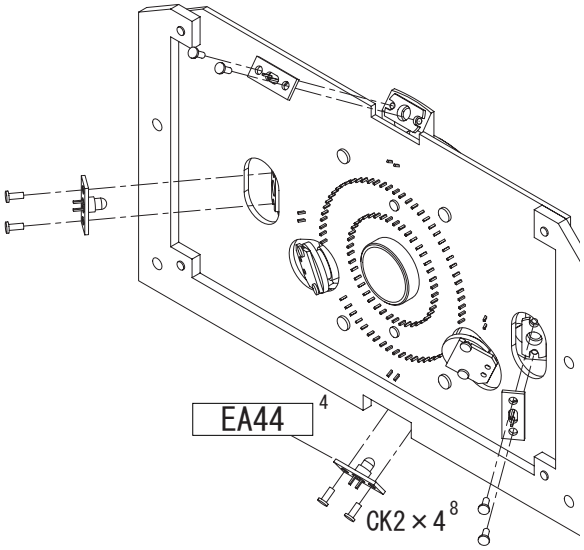
1. Remove the mire ASSY. (30601-4000). (see 6.13).
2. Unscrew CK2 × 3 (n = 4).
3. Replace the focus LED [30601-EA42 (n = 2)].
4. Reassemble the parts in reverse order.
5. Perform the alignment calibration (see 7.5).
6. Perform the KM calibration (see 7.7).
 * The KM calibration should be performed for the ARK-560A, ARK-530A and ARK-510A only.



6.17 KM6 LED

Replacement part: 30601-EA44

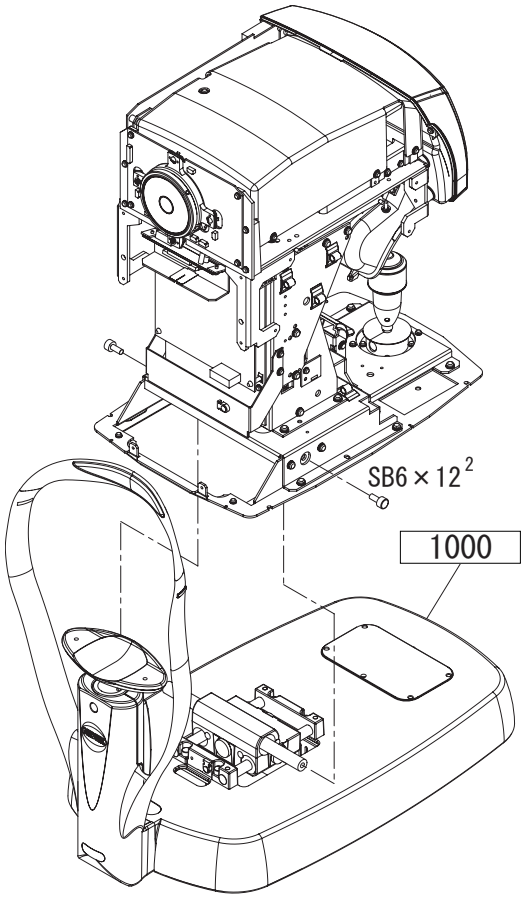
1. Remove the mire ASSY. (30601-4000). (see 6.13).
2. Unscrew CK2 × 4 (n = 8).
3. Replace the KM6 LED [30601-EA44 (n = 4)].
4. Reassemble the parts in reverse order.
5. Perform the alignment calibration (see 7.5).
6. Perform the KM calibration (see 7.7).
 * The KM calibration should be performed for the ARK-560, ARK-530A and ARK-510A only.



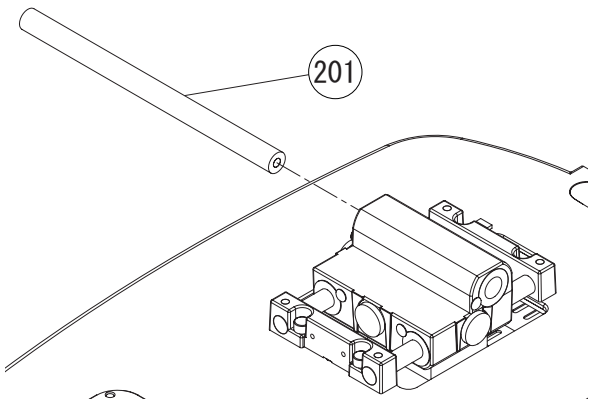
6.18 Left/Right Spindle

Replacement part: 30601-M201

1. Remove the covers (see Chapter 5).
2. Disconnect connector P201 (J1) on the tracking board (30601-BA02) and the GND cable of the base cable (30601-EA52).
3. Unscrew SB6 × 12 (n = 2) to remove the chinrest ASSY. (30601-5000) together with the base ASSY. (30601-1000).



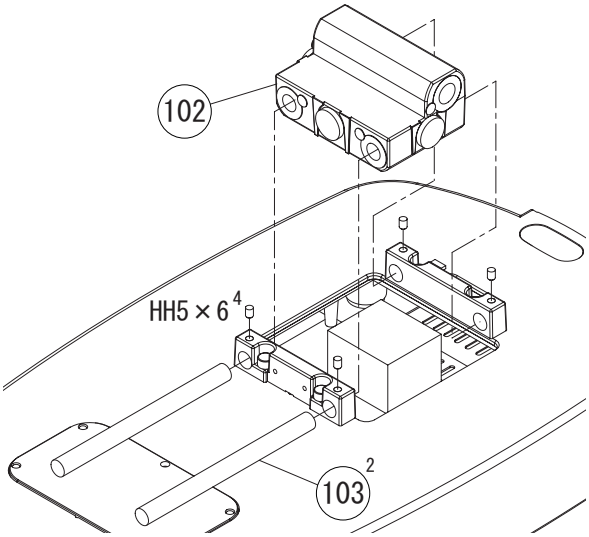
4. Replace the left/right spindle (30601-M201).
5. Reassemble the parts in reverse order.



6.19 Front/Back Spindle

Replacement part: 30601-M103

1. Remove the left/right spindle (30601-M201) (see 6.18).
2. Unscrew HH5 × 6 (n = 4) to replace the front/back spindles [30601-M103 (n = 2)].
3. Reassemble the parts in reverse order.
 * Reassemble so that the backward/forward and left/right movements are smooth.

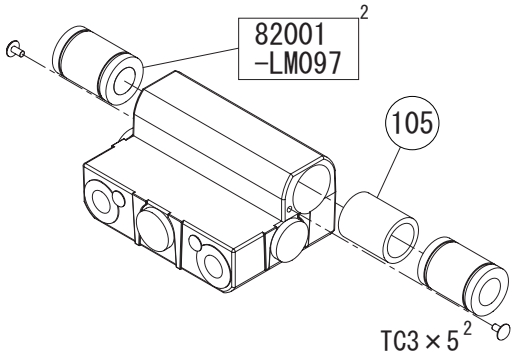


6.20 Linear Bush

6.20.1 Linear bush for left/right spindle

Replacement part: 82001-LM097

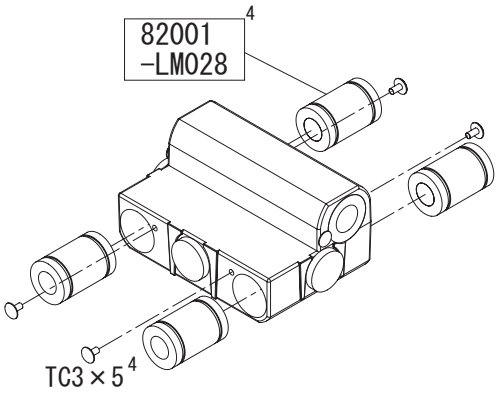
1. Remove the left/right spindle (30601-M201) (see 6.18).
2. Unscrew TC3 × 5 (n = 2) and replace the linear bushes [82001-ML097 (n = 2)].
3. Reassemble the parts in reverse order.
 * Reassemble so that the backward/forward and left/right movements are smooth.



6.20.2 Linear bush for front/back spindle

Replacement part: 82001-LM028

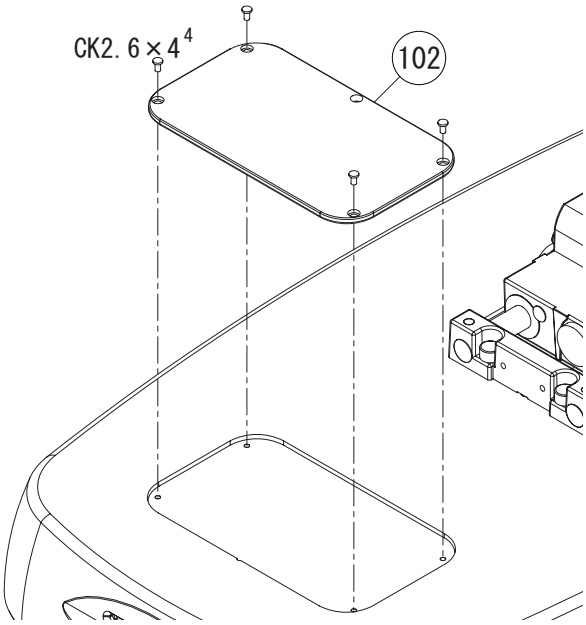
1. Unscrew HH5 × 6 (n = 4) to remove the front/back spindles [30601-M103 (n = 2)] and front/back slider (30601-M102) (see 6.19).
2. Unscrew TC3 × 5 (n = 4) to replace the linear bushes [82001-LM028 (n = 4)].
3. Reassemble the parts in reverse order.
 * Reassemble so that the backward/forward and left/right movements are smooth.



6.21 Slide Plate

Replacement part: 32105-M102

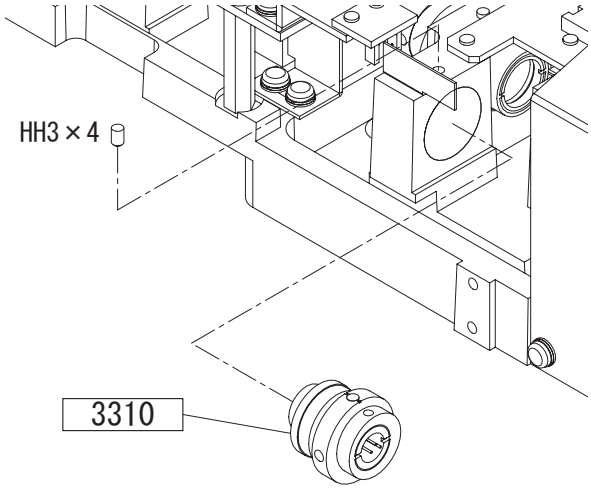
1. Unscrew SB6 × 12 (n = 2) to remove the chinrest ASSY. (30601-5000) together with the base ASSY. (30601-1000) (see 6.18).
2. Unscrew CK2.6 × 4 (n = 4) to replace the slide plate (32105-M102).
3. Reassemble the parts in reverse order.



6.22 Phototransmitter ASSY.

Replacement part: 30601-3310

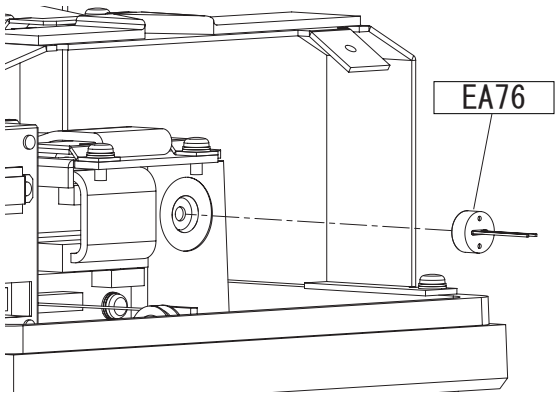
1. Remove the covers (see Chapter 5).
2. Disconnect connector P1405 (J5) on the sensor carry board (30601-BA14).
3. Unscrew HH3 × 4 to replace the phototransmitter ASSY. (30601-3310).
4. Reassemble the parts in reverse order.
5. Adjust the phototransmitter (see 7.3).
6. Perform the alignment calibration (see 7.5).
7. Perform the AR calibration (see 7.6).



6.23 Chart LED

Replacement part: 30601-EA76

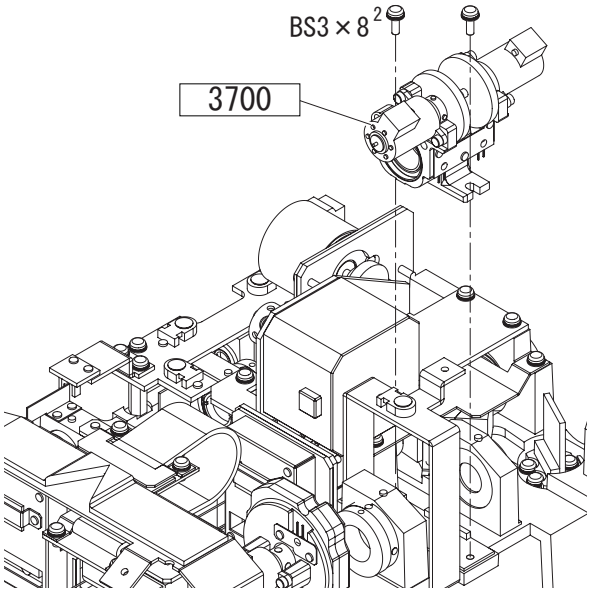
1. Remove the covers (see Chapter 5).
2. Disconnect connector P1406 (J6) on the sensor carry board (30601-BA14).
3. Replace the chart LED (30601-EA76) with a pair of tweezers.
4. Reassemble the parts in reverse order.



6.24 Subjective Cylinder ASSY.

Replacement part: 30703-3700

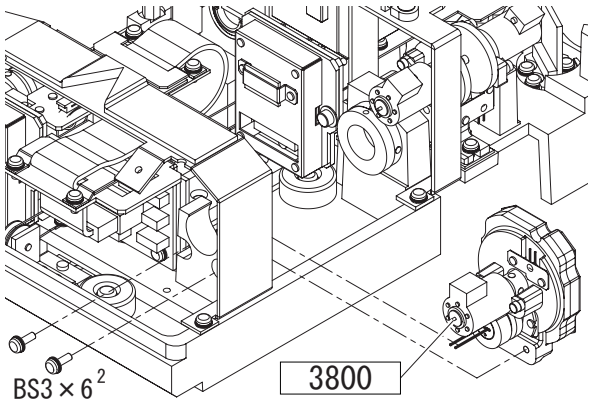
1. Remove the covers (see Section 5).
2. Disconnect P307 (J7) and P308 (J8) from the driver board (30601-BA03).
3. Unscrew BS3 × 8 (n = 2) to remove the subjective cylinder ASSY. (30703-3700).
4. Reassemble the parts in reverse order.
5. Adjust the subjective cylinder ASSY. (see 7.15).



6.25 Chart Disk ASSY.

Replacement part: 30703-3800

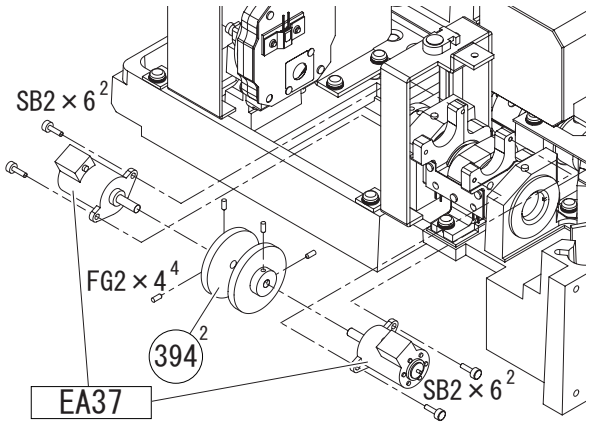
1. Remove the covers (see Section 5).
2. Disconnect P1404 (J4) from the sensor carry board (30601-BA14).
3. Unscrew BS3 × 6 (n = 2) to remove the chart disk ASSY. (30703-3800).
4. Reassemble the parts in reverse order.
5. Adjust the subjective cylinder ASSY. (see 7.15).



6.26 CL Motor

Replacement part: 30703-EA37

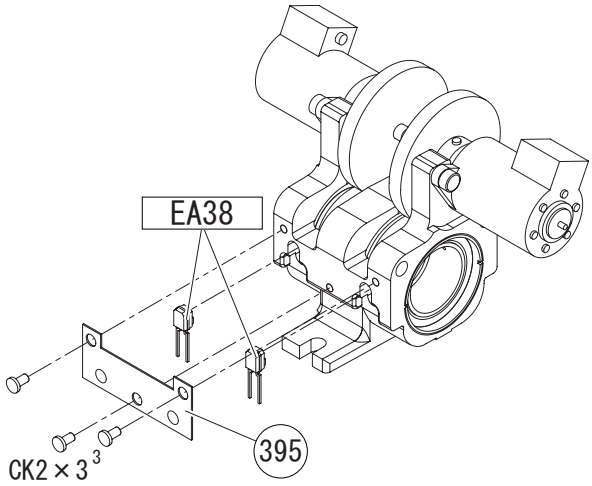
1. Move the subjective focus base (30703-3300) to the operator's side.
2. Unscrew SB2 × 6 (n = 4) to remove the CL motor (30703-EA37) along with the spur gears [30703-M394 (n = 2)].
3. Loosen FG2 × 4 (n = 4) and remove the spur gears [30703-M394 (n = 2)] to replace the CL motor (30703-EA37).
4. Reassemble the parts in reverse order.
5. Adjust the subjective cylinder ASSY. (see 7.15).



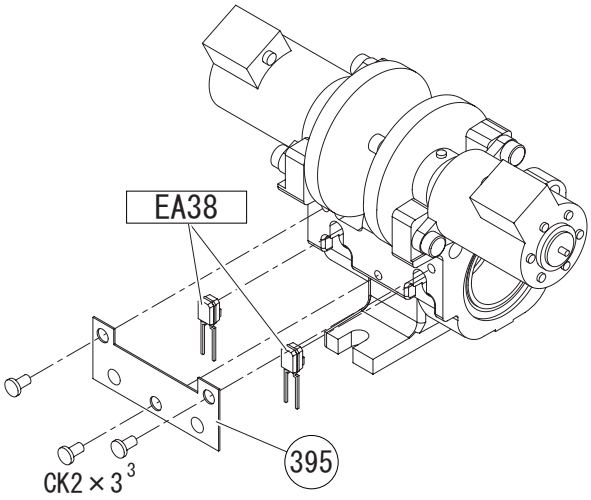
6.27 CL Sensor

Replacement part: 30703-EA38

1. Remove the subjective cylinder ASSY. (30703-3700) (see 6.25).
2. Unscrew CK2 × 3 (n = 3) to remove the sensor retainer (30703-M395). Then remove the infrared LED from the CL sensor (30703-EA38).



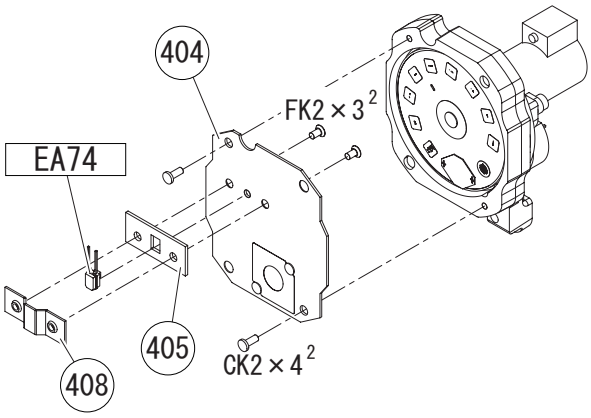
3. Unscrew CK2 × 3 (n = 3) to remove the sensor retainer (30703-M395). Then remove the phototransistor from the CL sensor (30703-EA38).
4. Reassemble the parts in reverse order.
5. Adjust the subjective cylinder ASSY. (see 7.15).



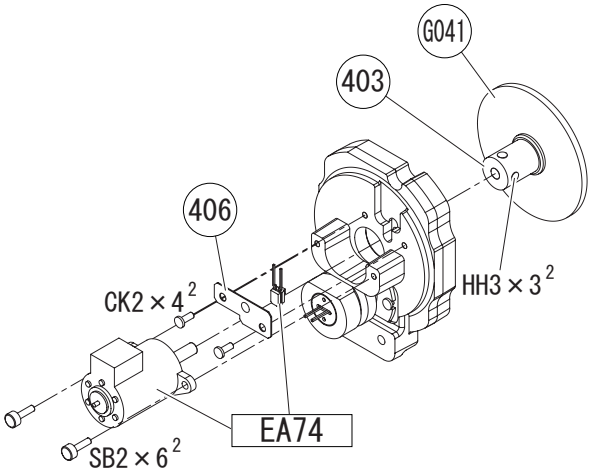
6.28 Chart

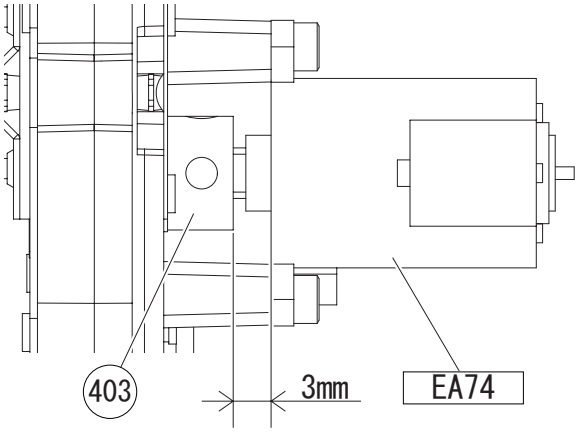
Replacement part: 30703-EA74

1. Remove the chart disk ASSY. (30703-3800) (see 6.26).
2. Unscrew CK2 × 4 (n = 2) to remove the disk cover (30703-M404).
3. Unscrew FK2 × 3 (n = 2) to remove the holder (30703-M408) and sensor stopper (30703-M405). Then remove the phototransistor of the chart (30703-EA74).
 * The wires from the phototransistor of the chart (30703-EA74) are gray and purple.



4. Loosen HH3 × 3 (n = 2) to remove the chart disk (30703-G041) along with the disk spindle (30703-M403).
5. Unscrew SB2 × 6 (n = 2) to remove the geared stepping motor from the chart (30703-EA74).
6. Unscrew CK2 × 4 (n = 2) to remove the LED retainer (30703-M406).
7. Remove the infrared LED from the chart (30703-EA74) to replace the chart.
 * The wires from the infrared LED of the chart (30703-EA74) are green and blue.
8. Reassemble the parts in reverse order.
 * Assemble the disk spindle (30703-M403) and geared stepping motor of the chart (30703-EA74) as shown to the right.
9. Adjust the chart (see 7.4).

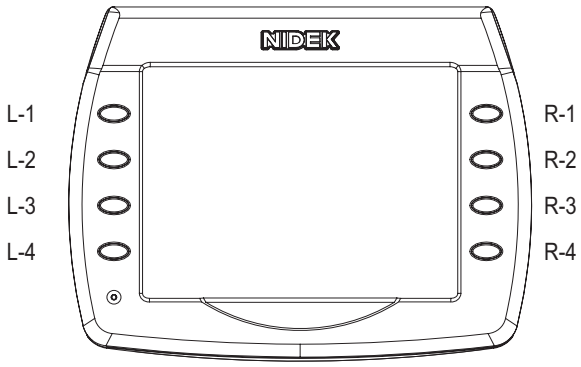




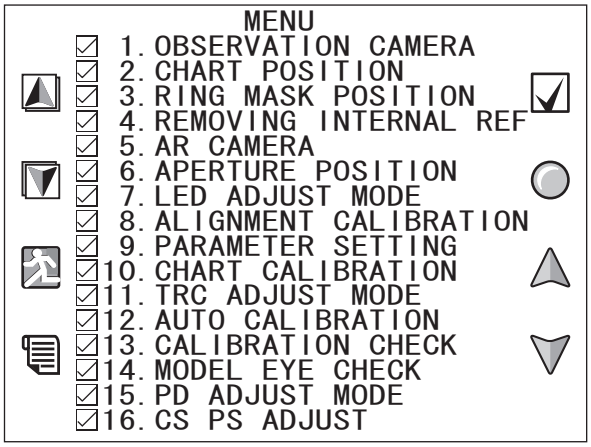
§7 ADJUSTMENT

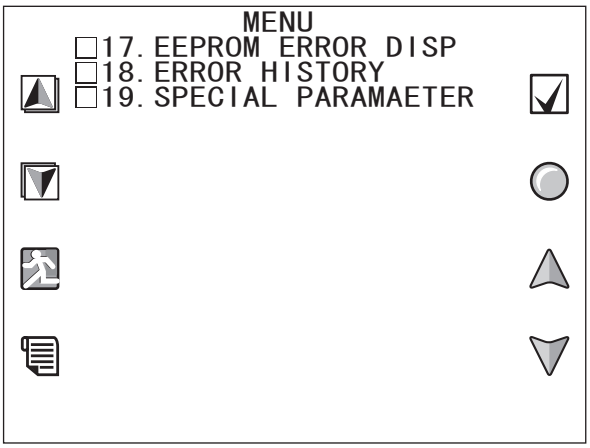
7.1 Entering Adjustment Mode

7.1.1 MENU mode



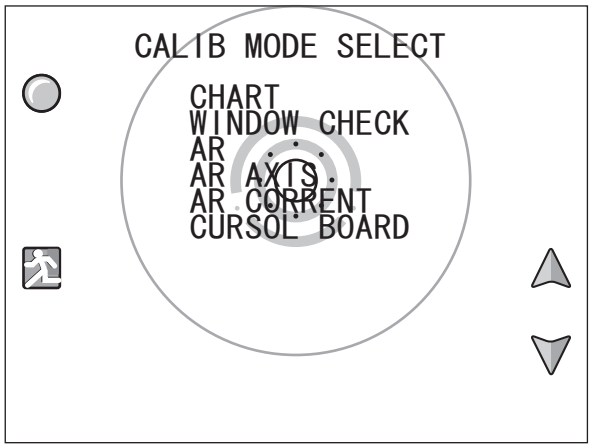
1. Turn on the power switch while pressing the L-1 and R-1 buttons of the function buttons.
 * Keep pressing the function buttons until a beep sounds.
2. The device starts and the password entry screen appears.
3. Press the function buttons in the order of R-3 to R-1 to L-2 to enter the password.
4. The MENU screen appears.
 * For the devices of the earlier versions, the display of the MENU screen is different.
5. When the earlier versions below are upgraded, ticks may not be entered properly.
 * There are no problems in operation or adjustment
 1) AR : Version 1.07 or ealier
 2) ARK: Version 1.05 or earlier
6. Press the up △ or down ▽ button to select each item.
 * When changing pages, use the page up ◭ or page down ▽ button.
7. Press the set button ○ to enter each adjustment mode.
 * The following items can be performed in the ARK-560A, ARK-530A, and ARK-510A only.
 1) 12. AUTO CALIBRATION
 2) 16. CS PS ADJUST





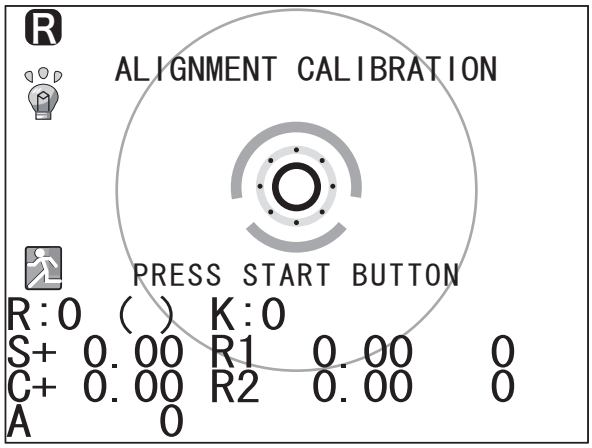
7.1.2 CALIB MODE SELECT (for AR)

1. Turn on the power switch while pressing the L-1 and R-2 buttons of the function buttons.
 * Continue pressing the function buttons until a beep sounds.
2. The CALIB MODE SELECT screen appears.
3. Press the up △ or down ▽ button to select each item.
4. Press the set button ○ to enter each adjustment mode.



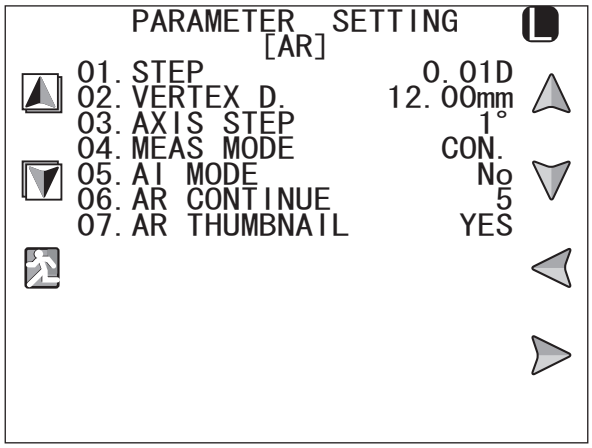
7.1.3 Alignment calibration

1. Turn on the power switch while pressing the L-1 and R-4 buttons of the function buttons.
 * Continue pressing the function buttons until a beep sounds.
2. Enter the ALIGNMENT CALIBRATION mode.



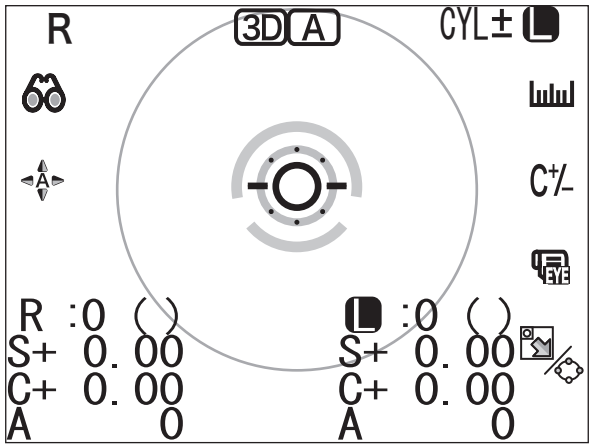
7.1.4 Measurement mode

1. Turn on the power switch while pressing the L-3 and R-1 buttons of the function buttons.
 * Continue pressing the function buttons until a beep sounds.
2. The measurement screen, the same as the normal measurement one, appears.
3. The measurement mode can be confirmed as follows:
 1) Display the PARAMETER SETTING screen and select AR (see 7.1.5).
 2) If the AR parameters are set as below, the measurement mode is activated.
 a. 01. STEP : 0.01 D
 b. 05. AI MODE : No
 c. 06. AR CONTINUE : 5

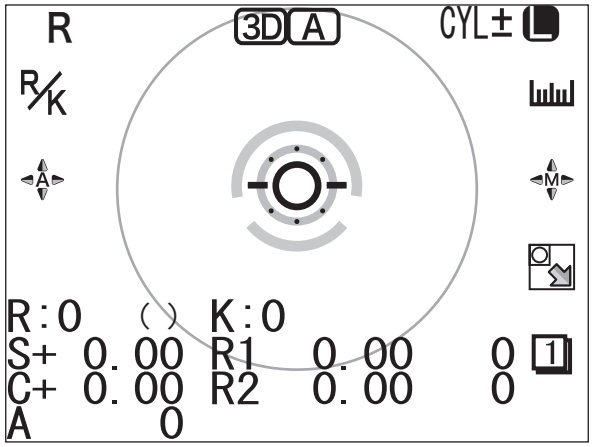


7.1.5 Parameter settings

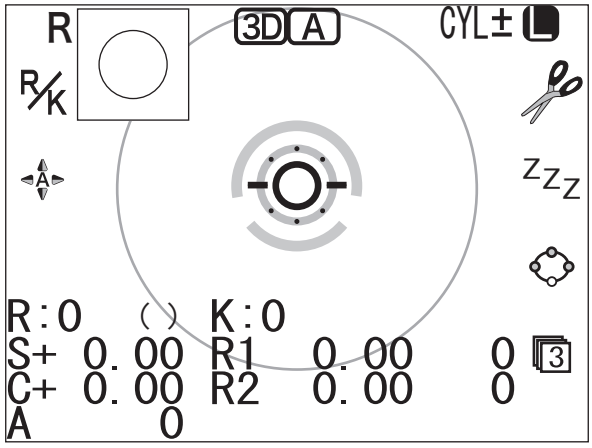
1. Display the PARAMETER SETTING screen following the steps below.
 1) For the AR-360A, AR-330A, and AR-310A, press the ring image enlargement/ parameter button for one second or more to display the PARAMETER SETTING screen.



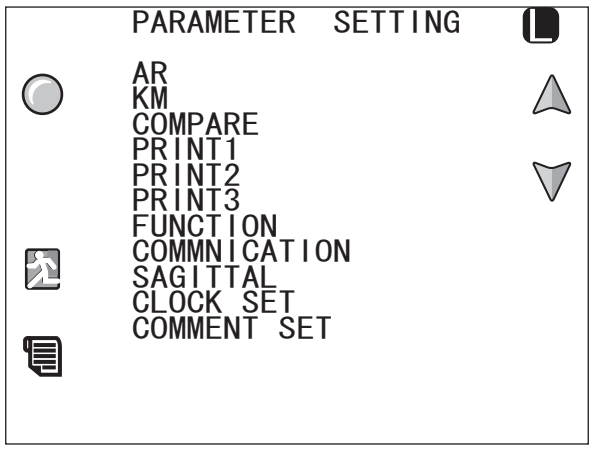
 2) For the ARK-530A and ARK-510A,
 a. Press the page selecting button in the order of 1 to 2 to 3 and select page 3.



 b. Press the parameter button for one second or more to display the PARAMETER SETTING screen.



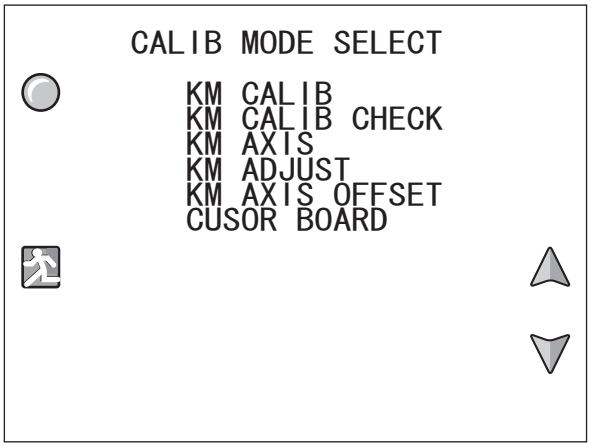
2. Select the item to be changed by pressing the up or down button and press the set button.
 * Parameters vary according to each model.
3. Press the exit button and return to the measurement screen.



7.1.6 CALIB MODE SELECT (for KM)

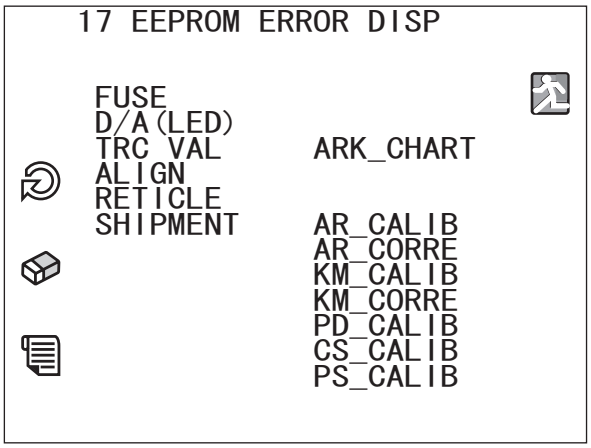
* The CALIB MODE SELECT screen for the KM can be displayed in the ARK-560A, ARK-530A, and ARK-510A only.

1. Turn on the power switch while pressing the L-1 and R-3 buttons of the function buttons.
 * Continue pressing the function buttons until a beep sounds.
2. The CALIB MODE SELECT screen appears.
3. Press the up ▲ or down ▼ button to select each item.
4. Press the set button ● to enter each adjustment mode.



7.1.7 EEPROM ERROR DISP

1. Enter the MENU mode and select 17. EEPROM ERROR DISP (see7.1.1).
2. Confirm that each item has no error.
 * The item that has an error is highlighted in pink.

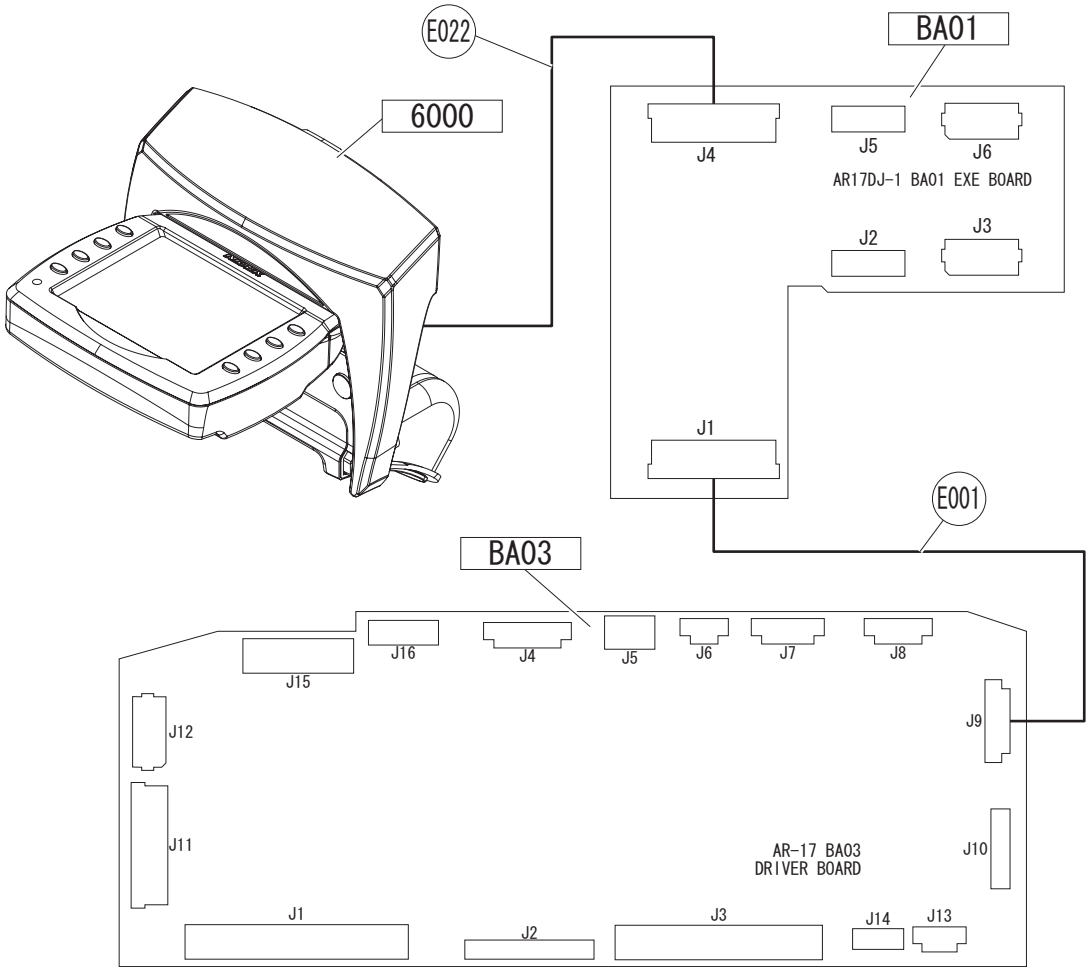


7.2 Adjusting CCD Camera

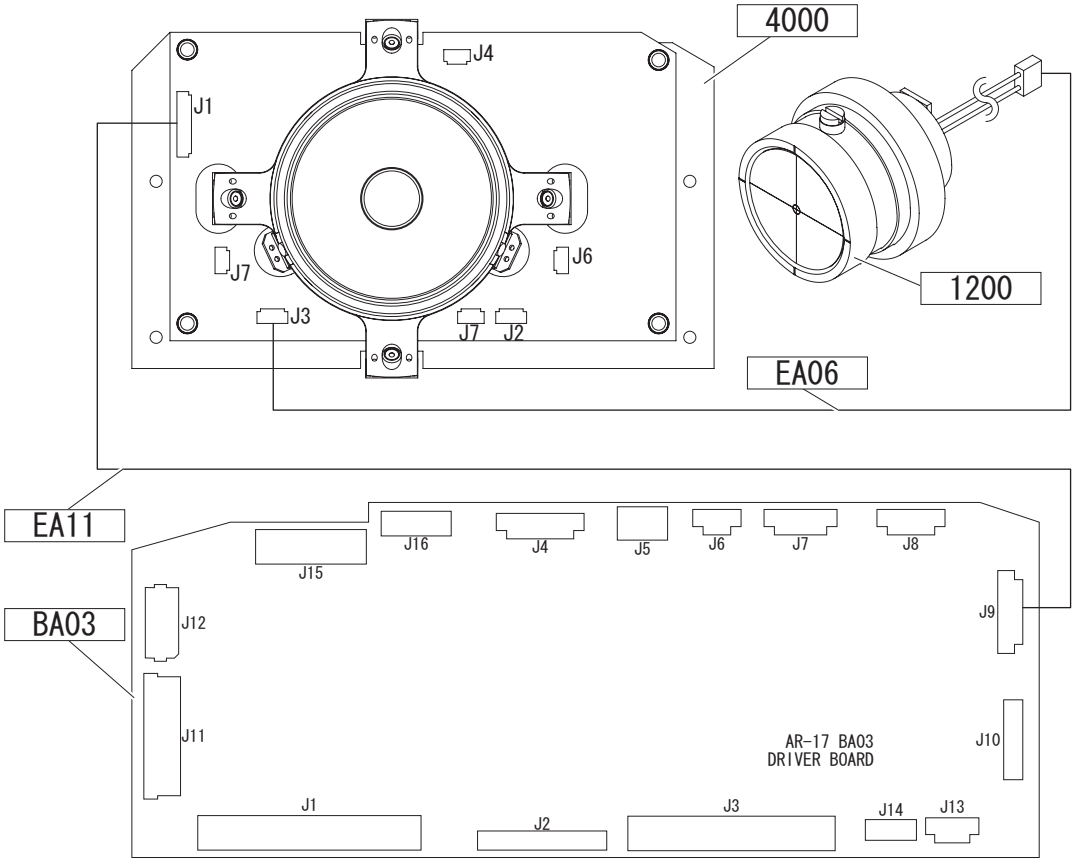
7.2.1 Attaching optical adjustment jigs for servicing

Jigs to be used: Relay board (30670-BA01)
: Flexible flat cable (30670-E001)
: Relay cable 3 (30670-EA06)
: EA39 extension cable (32557-EA11)
: Joint jig (30670-1100)
: Reticle illumination jig (30670-1200)

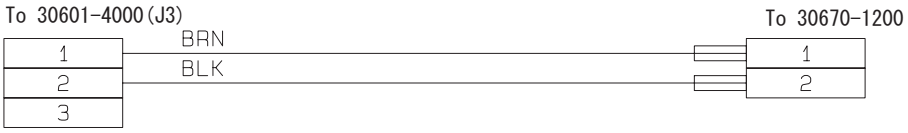
1. Remove the dust cover (30601-M304) (see 5.8).
2. Remove the mire ASSY. (30601-4000) (see 6.13).
3. Remove the motor ASSY. (30601-3600) (see 6.2.2).
4. Connect the flexible flat cable (30601-E002) of the rear cover ASSY. (30601-6000) of the measurement unit to connector J4 on the relay board (30670-BA01).
5. Connect the flexible flat cable (30670-E001) to connector J1 on the relay board (30670-BA01).
6. Connect the flexible flat cable (30670-E001) to connector J9 on the driver board (30601-BA03).



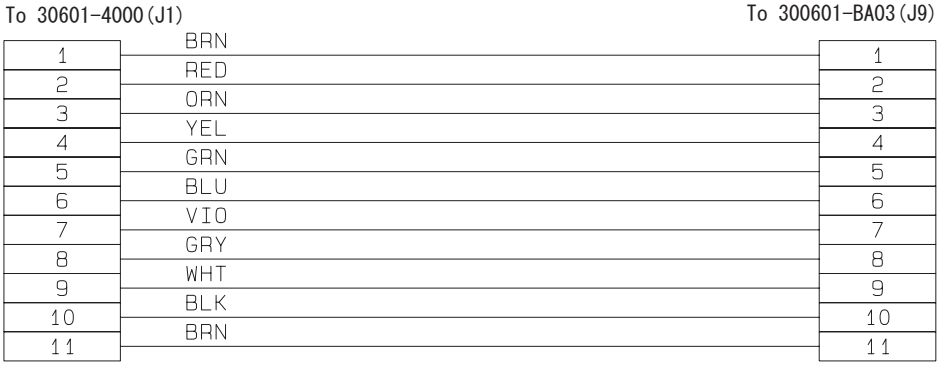
7. Connect the connector of relay cable 3 (30670-EA06) to the connector of the reticle illumination jig (30670-1200).
8. Connect the connector of relay cable 3 (30670-EA06) to connector J3 of the mire ASSY. (30601-4000).
9. Connect the connector of the EA39 extension cable (32557-EA11) to connector J1 of the mire ASSY. (30601-4000).
10. Connect the connector of the EA39 extension cable (32557-EA11) to connector J9 of the driver board (30601-BA03).



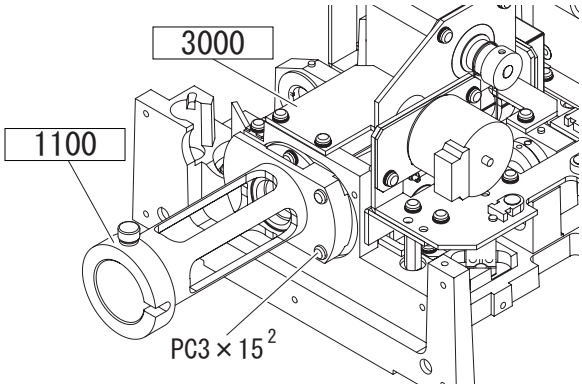
30670-EA06



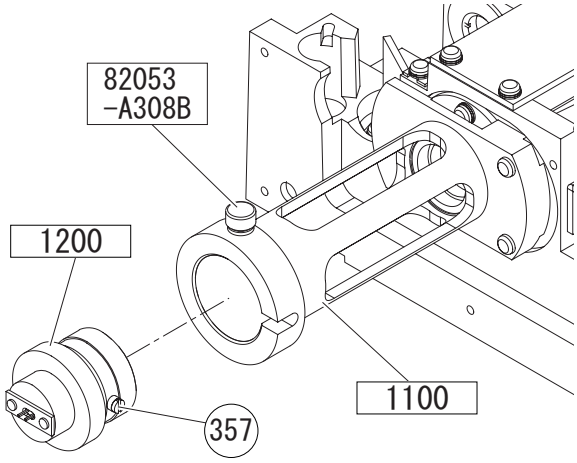
32557-EA11



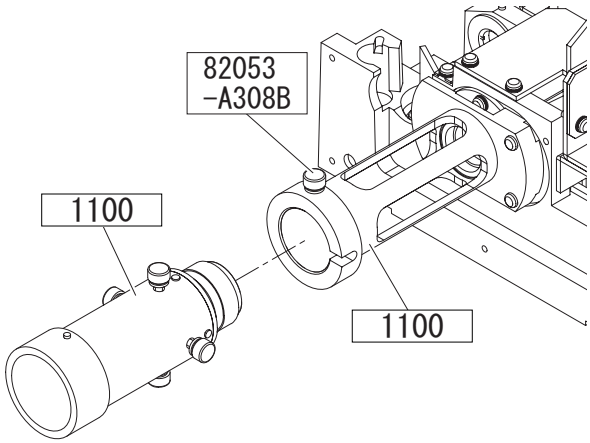
11. Attach the joint jig (30670-1100) to the measuring unit (30601-3E00) with PC3 × 15 (n = 2).



12. Attach the jigs as follows:
 1) Reticle illumination jig
 a. Align the key (31401-M357) of the reticle illumination jig (30670-1200) with the notch of the joint jig (30670-1100) and fix it with the stepped knurled screw (82053-A308B).

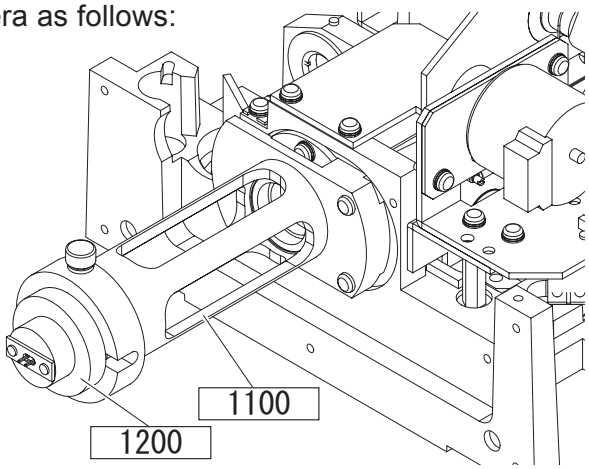


 2) 0 D model eye 2
 a. Attach 0 D model eye 2 (32177-0618) to the joint jig (30670-1100) and fix it with the stepped knurled screw (82053-A308B).

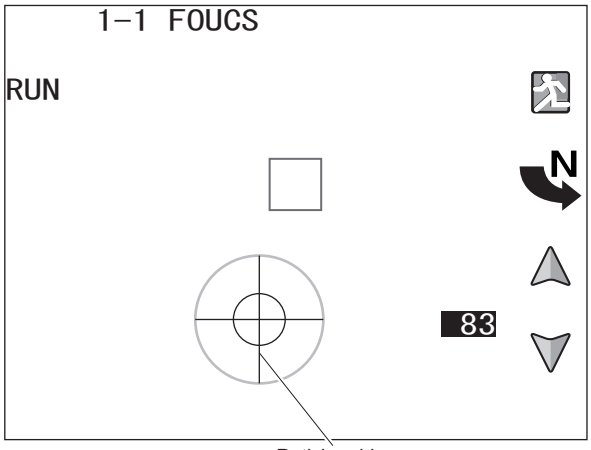


7.2.2 Adjusting observation CCD camera

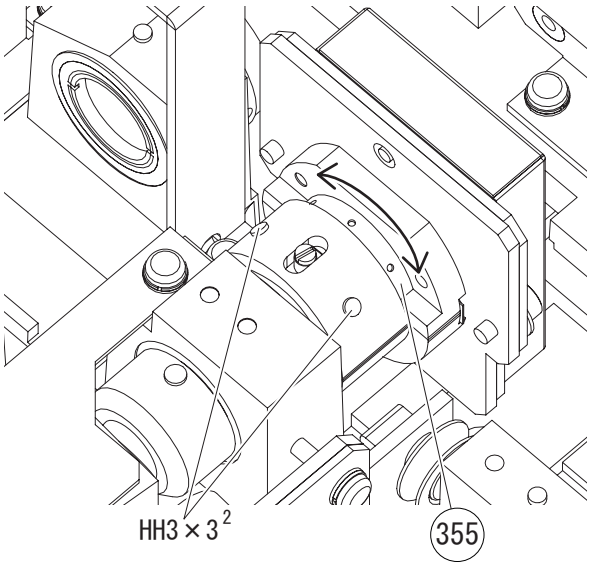
1. Remove the dust cover (30601-M304) (see 5.8).
2. Remove the mire ASSY. (30601-4000) (see 6.13).
3. Remove the motor ASSY. (30601-3600) (see 6.2.2).
4. Adjust the focus of the observation CCD camera as follows:
 1) Attach the reticle illumination jig (30670-1200) to the joint jig (30670-1100) (see 7.2.1).



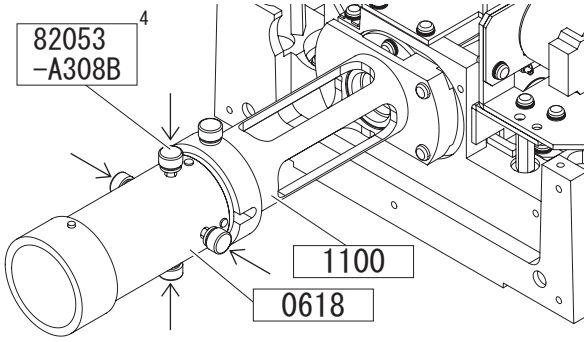
 2) Enter the MENU mode and select 1.OBSERVATION CAMERA (see 7.1.1).
 3) Press the function button to display RUN.
 * Adjust the brightness of the reticle illumination jig with the up △ or down ▽ button so that adjustment can be performed easily.



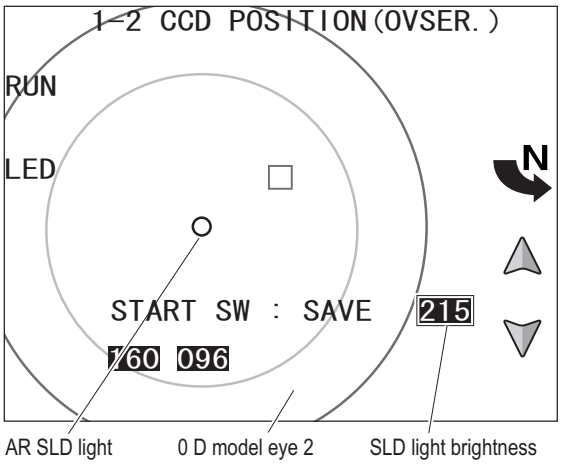
 4) Loosen HH3 × 3 (n = 2).
 5) Turn the adjustment ring (30601-M355) with a precision screwdriver to focus the reticle grid of the reticle illumination jig (30670-1200).
 6) Screw HH3 × 3 (n = 2).
 7) Remove the reticle illumination jig (30670-1200).

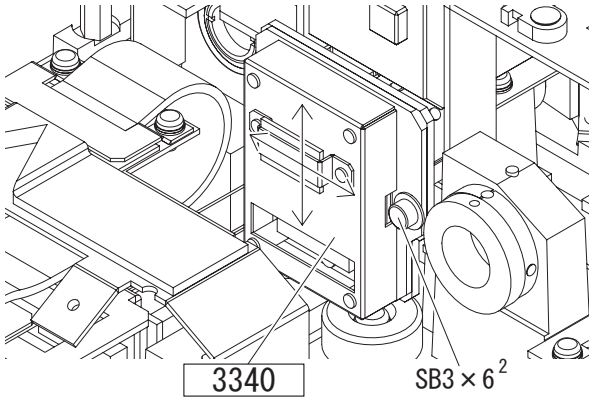


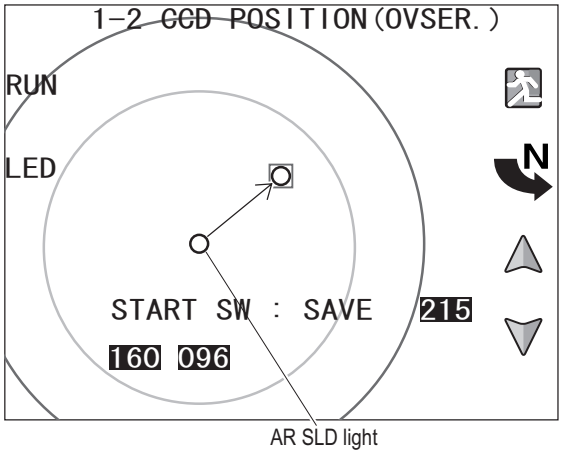
5. Adjust the position of the observation CCD camera as follows:
 1) Attach 0 D model eye 2 (32177-0618) to the joint jig (30670-1100) (see 7.2.1).



 2) Press the next button N to display the 1-2 CCD POSITION (OVSER.) screen.
 3) Press the function buttons to display RUN and LED.
 * Adjust the brightness of the SLD light with the up △ or down ▽ button so that adjustment can be performed easily.
 4) Perform adjustment with the stepped knurled screws [82053-A308B (n = 4)] on 0 D model eye 2 (32177-0618) so that the SLD light forms a doughnut shape.
 5) Loosen SB3 × 6 (n = 2) to adjust the position of the camera ASSY. (30601-3340) so that the centering box (□) of the observation CCD camera aligns with the SLD light.

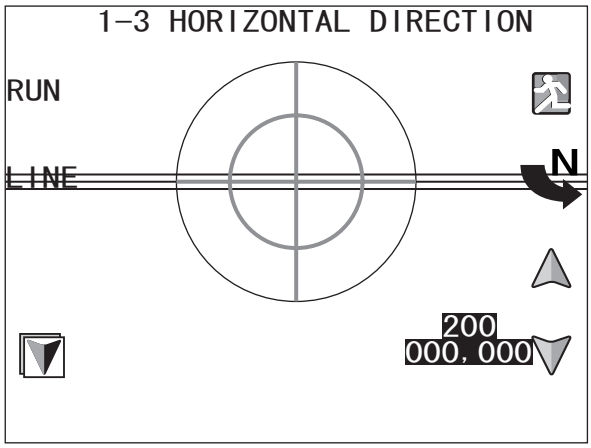


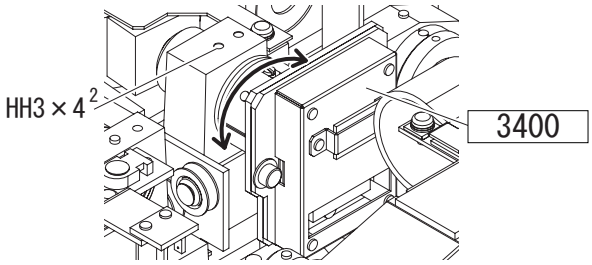


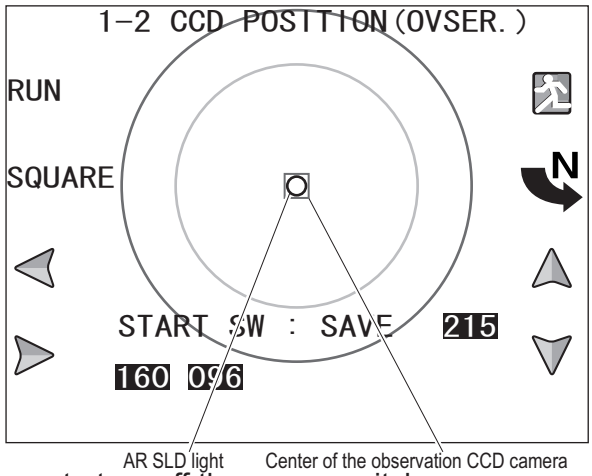


 6) Remove 0 D model eye 2 (32177-0618) after adjustment is completed.

6. Adjust the inclination of the observation CCD camera as follows:
 1) Attach the reticle illumination jig (30670-1200) (see 7.2.1).
 2) Press the next button N to display the 1-3 HORIZONAL DIRECTION screen.
 * Press the function buttons to display RUN and LED, and adjust the brightness of the reticle illumination jig with the up △ or down ▽ button so that the adjustment can be performed easily.
 3) Press the function buttons to display RUN and LINE.
 4) Loosen HH3 × 4 (n = 2) and adjust the inclination of the camera ASSY. (30601-3340) so that the horizotal line of the reticle illumination jig (30670-1200) becomes parallel to that on the screen.
 * Adjust the position of the horizontal line on the screen with the up △ or down ▽ button so that the adjustment can be performed easily.
 5) Press the page down button ▽ to display the 1-2 CCD POSITION (OVSER.) screen.
 6) Press the function buttons to display RUN and LED.
 7) Confirm that the centering box (□) of the observation CCD camera aligns with the SLD light. If it does not, precisely align it as follows:
 a. Press the function buttons on the 1-2 CCD POSITION (OVSER.) screen to display RUN and SQUARE.
 b. Perform adjustment with the up △, down ▽, right ▷, or left ◁ button so that the centering box (□) of the observation CCD camera aligns with the SLD light
 c. Press the start button to save the setting.
 * If the the centering box (□) of the observation CCD camera and the SLD light cannot be precisely aligned, perfrom Step 5 again to adjust the position of the camera ASSY.



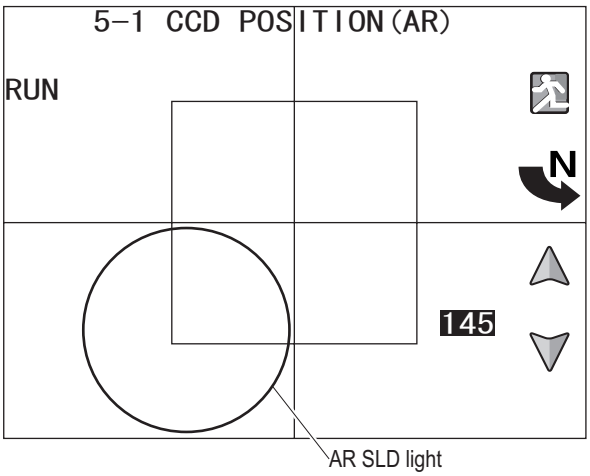




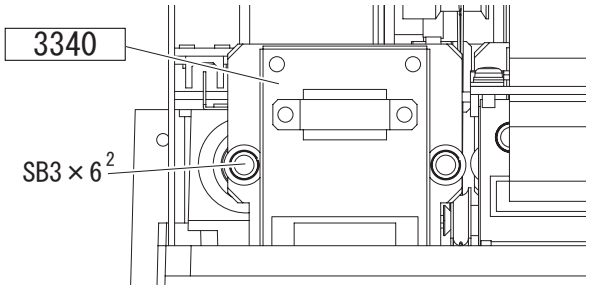
 8) After adjustment, press the exit button ⏻ once to turn off the power switch.
7. Reassemble the removed motor ASSY. (30601-3600) and covers.
8. Perform the alignment calibration (see 7.5).
9. Perform the KM calibration (see 7.7).
 * The KM calibration should be performed for the ARK-560A, ARK-530A, and ARK-510A only.
10. Perform AUTO TRC ADJUST (see 7.10).
11. Perform the CS and PS calibrations (see 7.12).
 * The CS and PS calibrations should be performed for the ARK-560A, ARK-530A, and ARK-510A only.

7.2.3 Measurement CCD camera

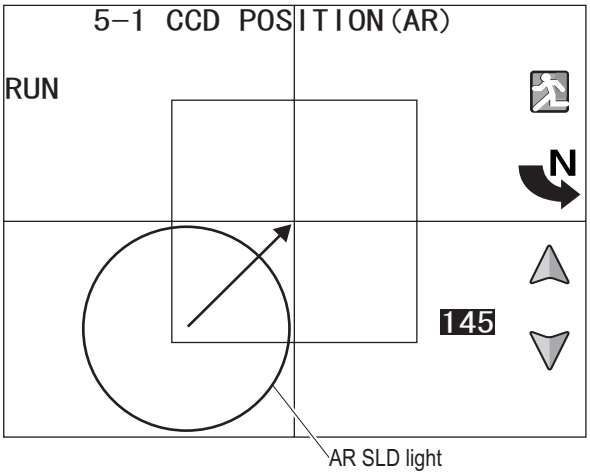
1. Remove the dust cover (30601-M304) (see 5.8).
2. Remove the mire ASSY. (30601-4000) (see 6.13).
3. Attach 0 D model eye 2 (32177-0618) (see 7.2.1).
4. Enter the MENU mode and select 5. AR CAMERA (see 7.1.1).
5. Press the function button to display RUN.



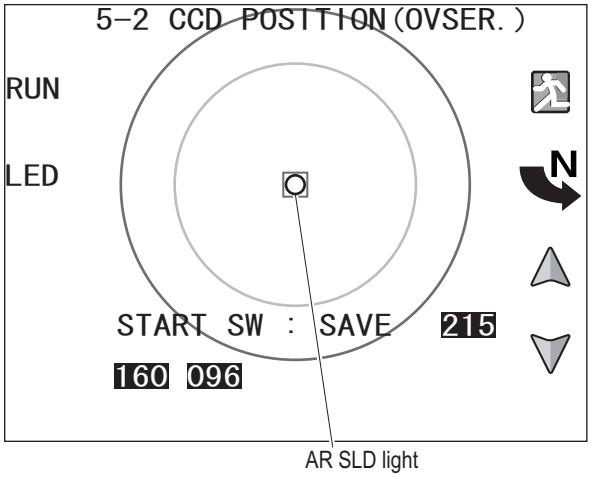
6. Loosen SB3 × 6 (n = 2).



7. Adjust the position of the camera ASSY. (30601-3340) so that the scale (☐ and cross hairs) displayed on the LCD monitor aligns with the center of the SLD light.



8. Press the next button N to display the 5-2 CCD POSITION (OVSER.) screen.
9. Press the function buttons to display RUN and LED.
10. Confirm that the centering box (☐) of the observation CCD camera aligns with the SLD light.
11. After adjustment is completed, press the exit button to turn off the power.
12. Reassemble the removed covers.
13. Perform the AR calibration (see 7.6).



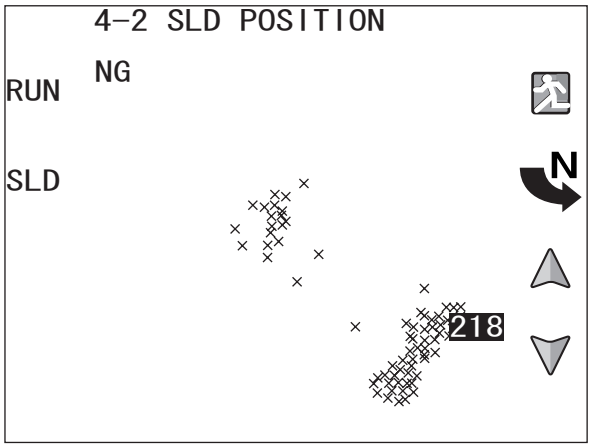
7.3 Phototransmitter

1. When using a dark room, remove the internal reflection (see 7.3.1).
2. When not using a dark room, perform the optical axis adjustment of AR SLD (see 7.3.2).

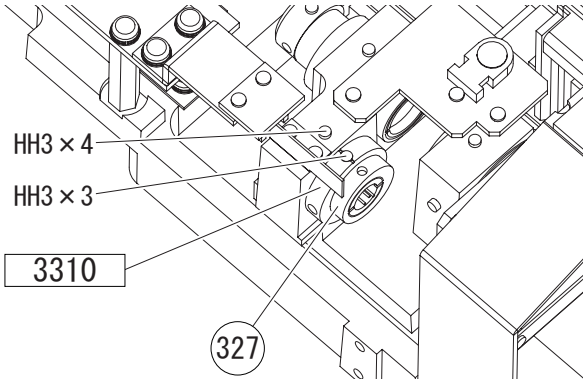
7.3.1 Removing internal reflection

* Be sure to perform the removal of internal reflection in a dark room.
* Do not place any reflective object on the patient's side.

1. Remove the dust cover (30601-M304) (see 5.8.)
2. Enter the MENU mode and select 4. REMOVING INTERNAL REF (see 7.1.1).
3. Press the next N button to display the 4-2 SLD POSITION screen.
4. Press the function buttons to display RUN and SLD.
5. Move the focus base ASSY. (30601-3300) toward the operator's side manually.
 * Marks appear where the internal reflections are found and NG is displayed to the upper left on the screen as shown to the right.



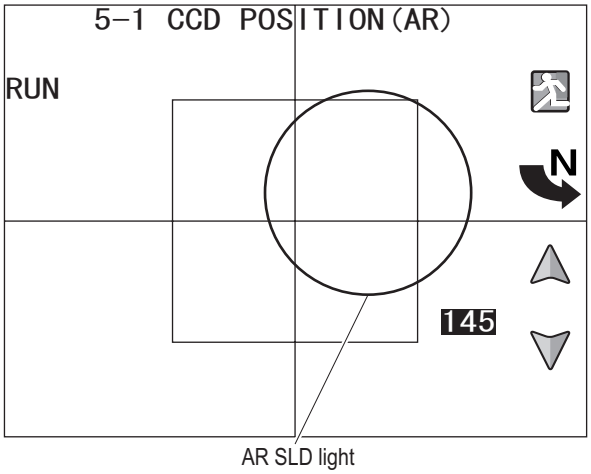
6. Follow the steps below so that the marks of the internal reflections disappear and OK is displayed to the upper left on the screen.
 1) Loosen HH3 × 3 to turn the SLD holder (30601-M327) of the phototransmitter ASSY.
 2) Loosen HH3 × 4 to turn the phototransmitter ASSY. (30601-3310).



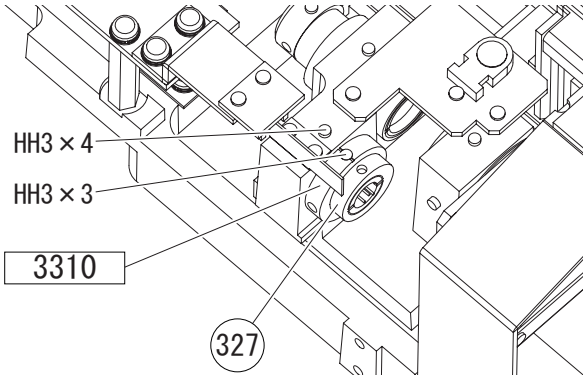
7. Move the focus base ASSY. (30601-3300) toward the patient's side and confirm that the marks of the internal reflections and NG to the upper left on the screen disappear.
 * When OK is not displayed to the upper left on the screen although the marks of the internal reflections disappear in the movable range of the focus base ASSY. (30601-3300), perform Step 5 once again.
 * When the measurement CCD camera has stuck pixels, one mark of the internal reflection is always displayed.
 * When the measurement CCD camera has stuck pixels and two or more marks of the internal reflections are displayed, replace the measurement CCD camera (30601-E001) (see 6.4.1).
8. Press the exit button after adjustment is completed.
9. Adjust the measurement CCD camera (see 7.2.3).
10. Reassemble the removed covers.
11. Perform the AR calibration (see 7.6).

7.3.2 Optical adjustment of AR SLD

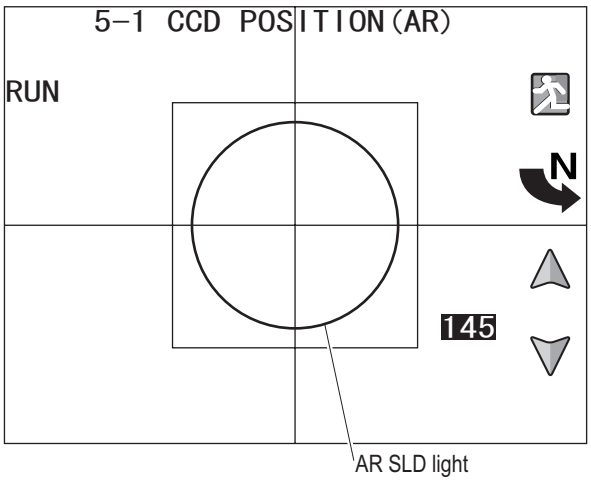
1. Remove the dust cover (30601-M304) (see 5.8).
2. Remove the mire ASSY. (30601-4000) (see 6.13).
3. Attach the 0 D model eye 2 (32177-0618) (see 7.2.1).
4. Enter the MENU mode and select 5. AR CAMERA (see 7.1.1).
5. Press the function button to display RUN.



6. Follow the steps below so that the scale (□ and cross hairs) displayed on the LCD monitor aligns with the center of the SLD light.
 1) Loosen HH3 × 3 to turn the SLD holder (30601-M327) of the phototransmitter ASSY.
 2) Loosen HH3 × 4 to turn the phototransmitter ASSY. (30601-3310).

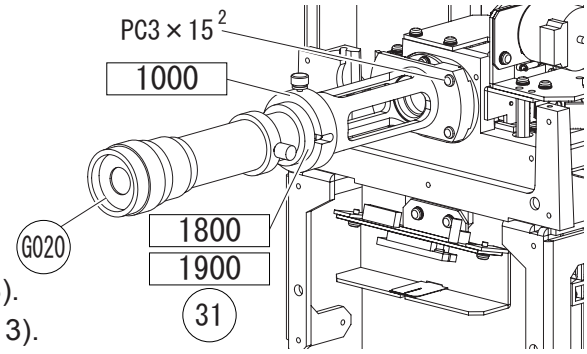


7. After adjustment is completed, press the exit button to turn off the power.
8. Reassemble the removed covers.
9. Perform the AR calibration (see 7.6).



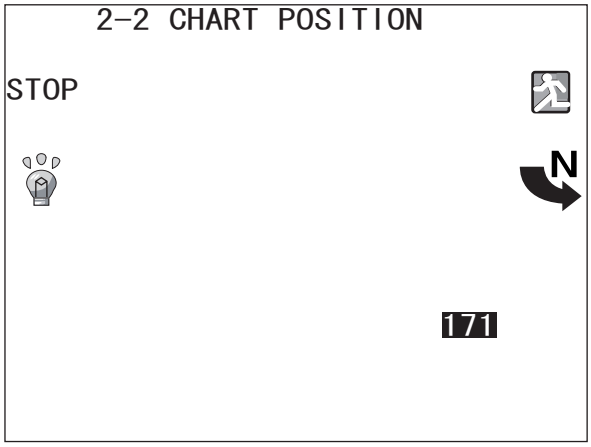
7.4 Chart Adjustment

7.4.1 AR-310A, AR-330A, ARK-510A, ARK-530A

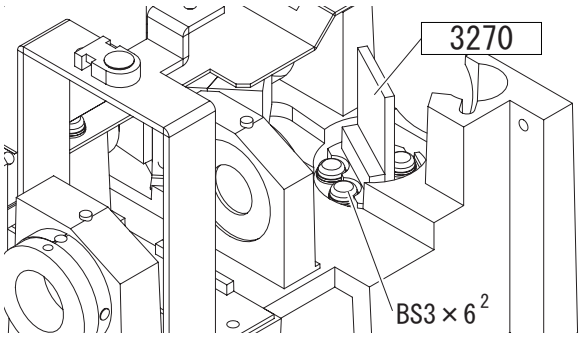


* This adjustment should be perfromed for AR-310A, AR-330A, ARK-510A, and ARK-530A only.
* When adjustment jigs are not available, return the device to the factory without performing adjustment.

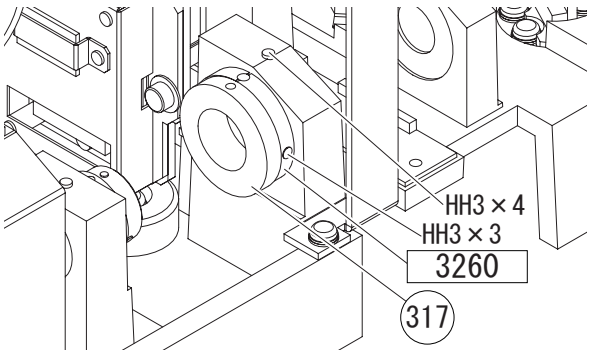
1. Remove the dust cover (30601-M304) (see 5.8).
2. Remove the mire ASSY. (30601-4000) (see 6.13).
3. Attach the joint jig (30670-1100) (see 7.2.1).
4. Attach any of the following jigs and dioptric tester (99104-G020) to the joint jig.
 1) 0 D : Holder (30670-M031)
 2) -12 D : Chart lens M (30670-1800)
 3) +12 D : Chart lens P (30670-1900)
5. Enter the MENU mode and select 2. CHART POSITION (see 7.1.1).
6. Press the function button to display STOP.
7. Press the function buttons to display and turn on the chart LED.



8. Follow the steps below to adjust the optical axis of the chart.
 1) Move the focus base ASSY. (30601-3300) to the position where the chart can be seen through the dioptric tester.
 2) Confirm that the chart does not move to right or left at any position of -12 D, 0 D, or +12 D.
 3) If the chart moves to right or left, loosen BS3 × 6 (n = 2) to adjust the position of the chart mirror ASSY. (30601-3270).



 4) Follow the steps below so that the target grid center of the dioptric tester fits into the inner circle of the clock dial chart at all positions of -12 D, 0 D, and +12 D.
 a. Loosen HH3 × 3 to turn chart lens holder 2 (30601-M317) of the chart lens 2 ASSY.
 b. Loosen HH3 × 4 to turn the chart lens 2 ASSY. (30601-3260).

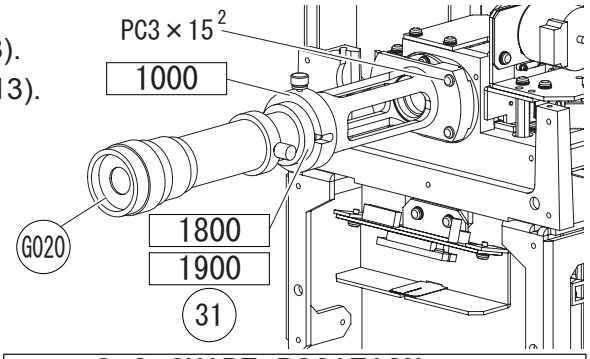


9. After adjustment is completed, press the exit button to turn off the power.
10. Reassemble the removed covers.
11. Perform the chart calibration (see 7.6.5).

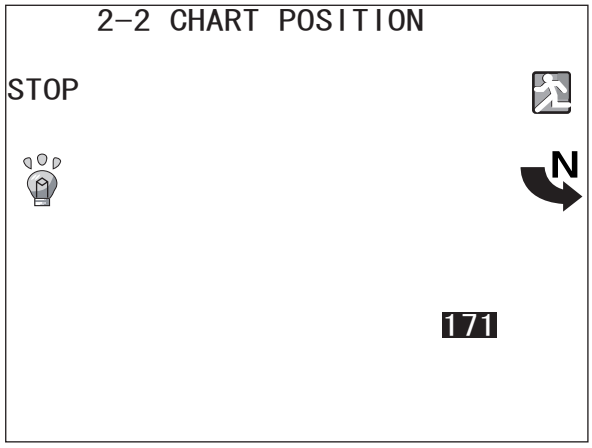
7.4.2 AR-360A, ARK-560A

* This adjustment should be performed for the AR-360A and ARK-560A only.
* When adjustment jigs are not available, return the device to the factory without performing adjustment.

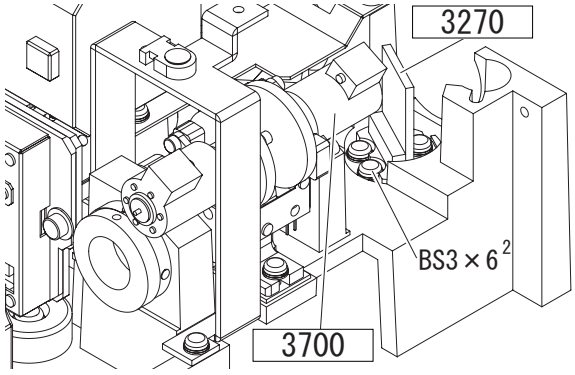
1. Remove the dust cover (30601-M304) (see 5.8).
2. Remove the mire ASSY. (30601-4000) (see 6.13).
3. Attach the joint jig (30670-1100) (see 7.2.1).
4. Attach any of the following jigs and dioptric tester (99104-G020) to the joint jig.
 1) 0 D : Holder (30670-M031)
 2) -12 D : Chart lens M (30670-1800)
 3) +12 D : Chart lens P (30670-1900)



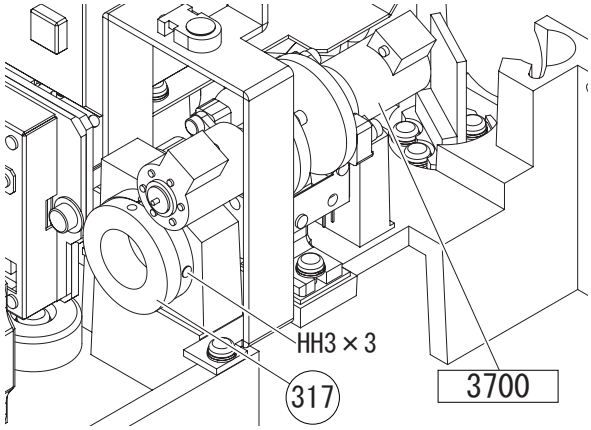
5. Enter the MENU mode and select 2. CHART POSITION (see 7.1.1).
6. Press the next button N to display 2-2 CHART POSITION.
7. Press the function button to display STOP.
8. Press the function buttons to display and turn on the chart LED.



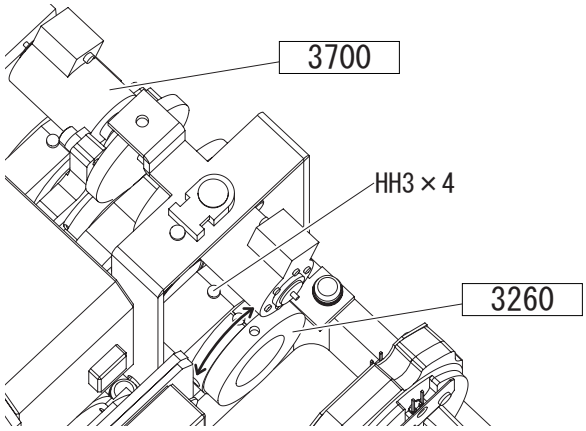
9. Follow the steps below to adjust the optical axis of the chart.
 1) Move the focus base ASSY. (30601-3300) to the position where the chart can be seen through the dioptric tester.
 2) Confirm that the chart does not move to right or left at any position of -12 D, 0 D, or +12 D.
 3) If the chart moves to right or left, loosen BS3 × 6 (n = 2) to adjust the position of the chart mirror ASSY. (30601-3270).



 4) Follow the steps below so that the target grid center of the dioptric tester fits into the inner circle of the clock dial chart at all positions of -12 D, 0 D, and +12 D.
 a. Loosen HH3 × 3 to turn chart lens holder 2 (30601-M317) of the chart lens 2 ASSY.



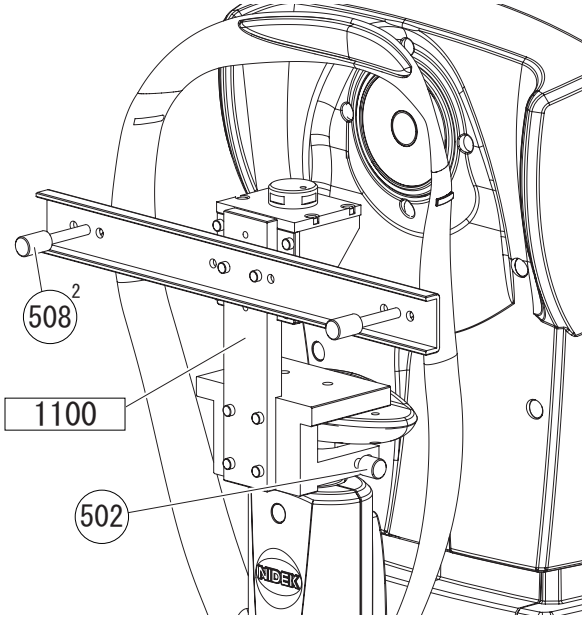
b. Loosen HH3 × 4 to turn the chart lens 2 ASSY. (30601-3260).



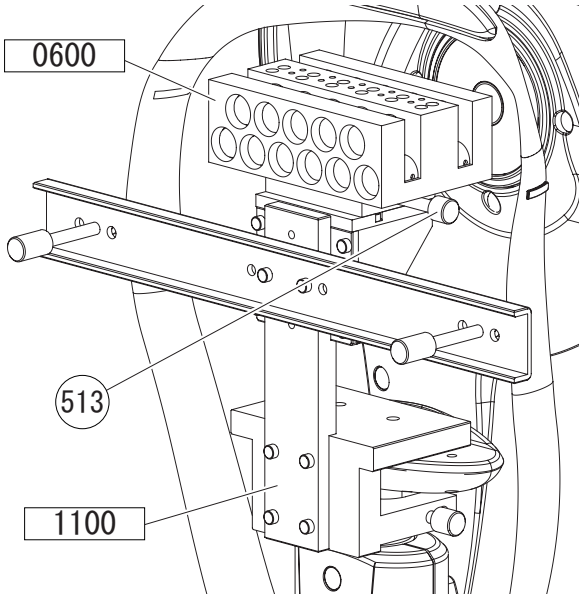
10. After adjustment is completed, press the exit button to turn off the power.
11. Reassemble the removed covers.
12. Perform the chart calibration (see 7.6.5).

7.5 Alignment Calibration

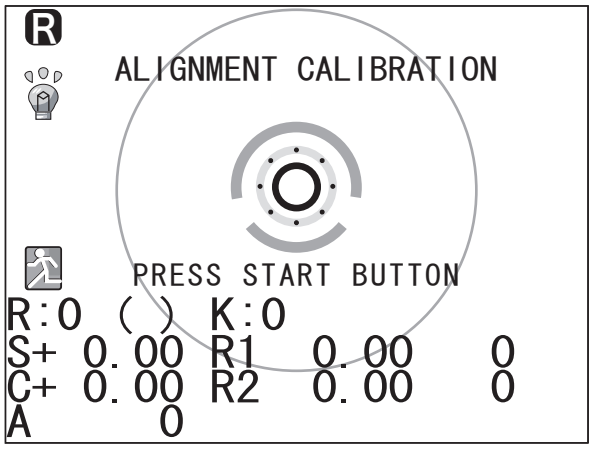
1. Attach the following jigs.
 1) 22-model eye jig, Chinrest attachment jig
 a. Attach the chinrest attachment jig (32107-1100) to the chinrest ASSY. (30601-5000).
 * Fix the jig with the knobs (32177-M502, 32177-M508).



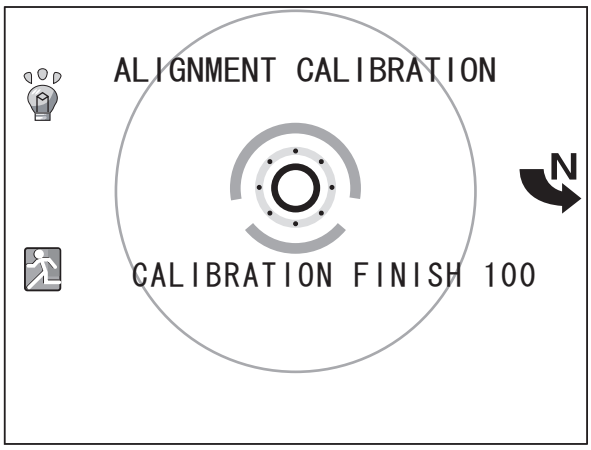
 b. Attach the 22-model eye jig (32171-0600) to the chinrest attachment jig (32107-1100).
 * Fix the jig with the knob (32177-M513).



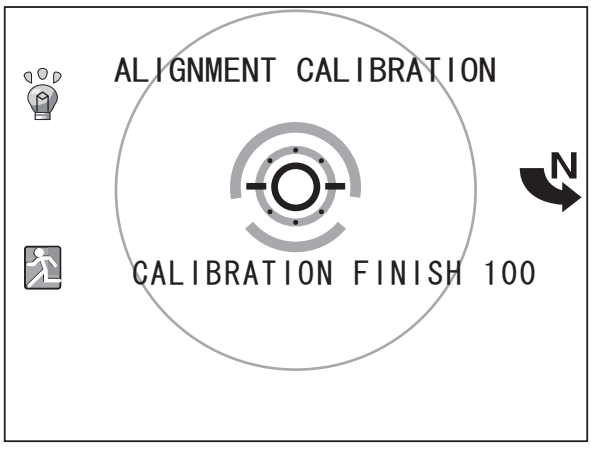
2. Enter the MENU mode and select 8. ALIGNMENT CALIBRATION (see 7.1.1).
3. Align the 0 D model eye as follows:
 1) Align the inner mire illuminating weakly with the target center.
 2) Align and focus the outer mire.
4. Press the start button and perform the alignment calibration.
 * A beep sounds when the start button is pressed.



5. ”CALIBRATION FINISH 100” is displayed after the alignment calibration is completed.



6. The focusing indicator appears automatically.
7. Confirm that the alignment position (up/down and left/right positions, and backward/forward focusing position) aligns with the focusing indicator.



7.6 AR Calibration

7.6.1 AR calibration

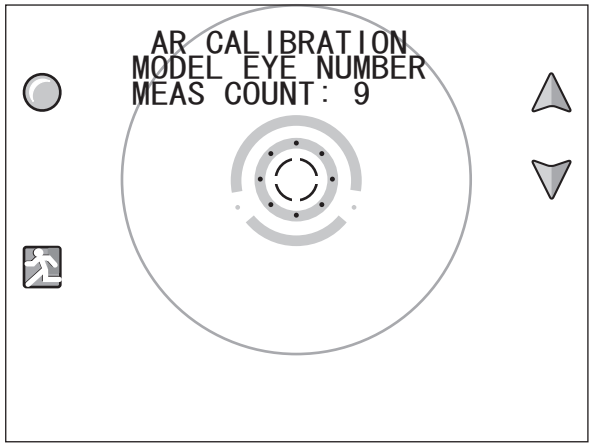
1.Attach the following jigs.
 a. Chinrest attachment jig (32107-1100)
 b. 22-model eye jig (32171-0600)

2. Display the CALIB MODE SELECT (for AR) screen and select AR (see 7.1.2).

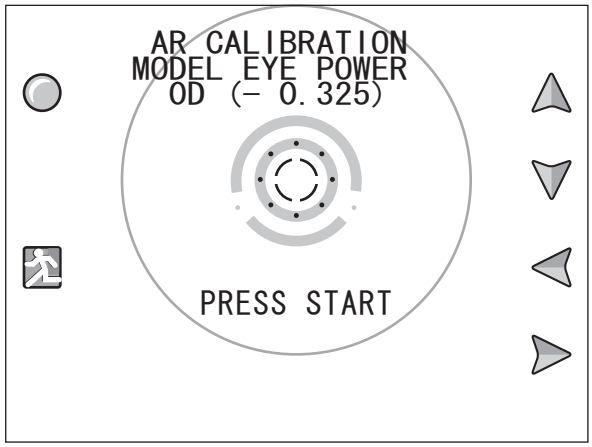
3. Select CUSTOM with the up △ or down ▽ button, and press the set button ◯.



4. Set MEAS COUNT as described below with the up △ or down ▽ button and press the set button ◯.
 1) 22-model eye jig (32171-0600): 9



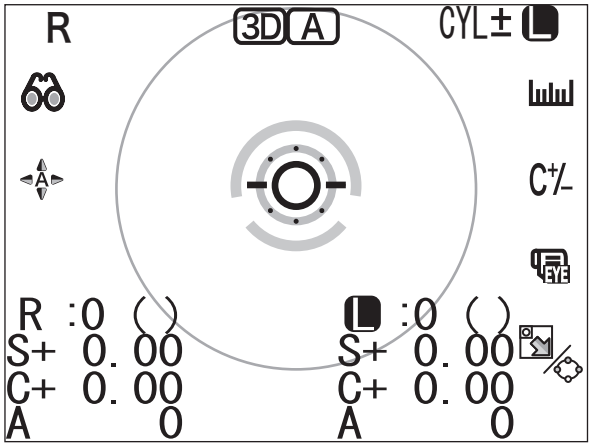
5. Follow the steps below to perform the AR calibration.
 1) Enter the correction value for each diopter of model eye, which is displayed on the screen, with the right ▷ or left ◁ button.
 2) Align the model eye and press the start button to start the AR calibration.
 3) Change the displayed diopter with the up △ or down ▽ button. Perform the AR calibration for all model eyes following Steps 1) and 2).



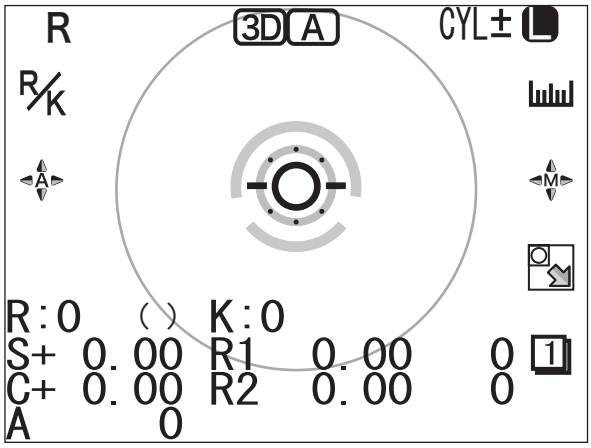
 * Be sure to keep alignment during the AR calibration.
 * When misalignment occurs, display the numeric value of the misaligned model eye and perform the AR calibration once again.

6. After the AR calibration is completed, press the exit button to turn off the power.

7. Enter the measurement mode (see 7.1.4).
 1) For the AR-360A, AR-330A, and AR-310A, the screen shown to the right appears.



 2) For the ARK-560A, ARK-530A, and ARK-510A, the screen shown to the right appears.

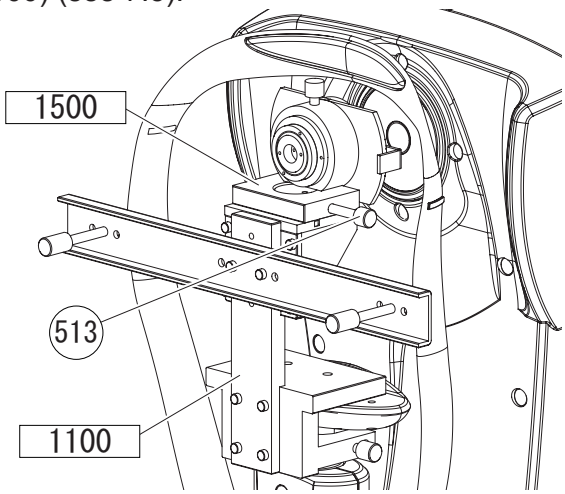


8. Press the auto button ◂A▸ to select 3D auto-tracking (3D) and auto-shot (A).
 * For the AR-310A and ARK-510A, the indication of auto-tracking is (▲▼).
9. Press the CYL mode button C+/- to select CYL-.
10. Measure the following model eye and confirm that the measured values are within the specified range.
 1) 22-model eye jig (32171-0600)

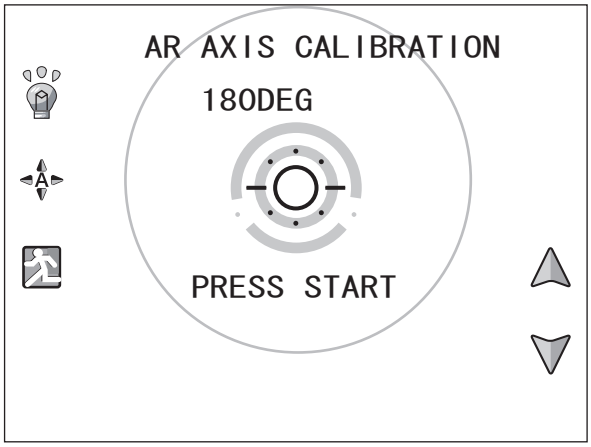
Nominal value	SPH measurement accuracy	CYL measurement accuracy
0 D	±0.10 D	0.10 D
±4 D	±0.10 D	0.10 D
±8 D	±0.11 D	0.11 D
±10 D	±0.12 D	0.12 D
±14 D	±0.18 D	0.15 D
±20 D	±0.30 D	0.23 D

7.6.2 AR axis

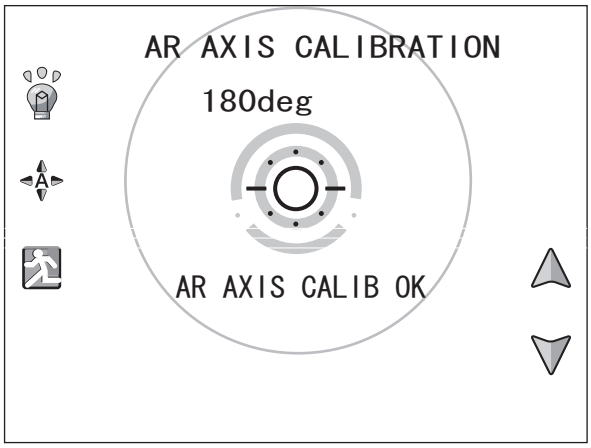
1. Attach the following jigs.
 1) Attach the chinrest attachment jig (32107-1100) (see 7.5).
 2) Attach the cylinder axis adjustment jig (32177-1500) to the chinrest attachment jig (32107-1100)
 * Fix the jig with the knob (32177-M513).



2. Display the CALIB MODE SELECT (for AR) screen (see 7.1.2).
3. Select AR AXIS with the up △ or down ▽ button and press the set button ○.
4. Align the marking-off line with the three horizontal lines of the cylinder axis adjustment jig.
5. Match the numeric value to the nominal value for 180º which is inscribed on the base of the cylinder axis adjustment jig with the up △ or down ▽ button.
6. Press the lamp button to light up the mire.
7. Confirm that the mire ring aligns with the target center and that the target displays the optimum condition, then press the start button.
 * When the lamp button is pressed and the mire is lit, auto-tracking activates.
 * Pressing the auto button enters the manual mode.



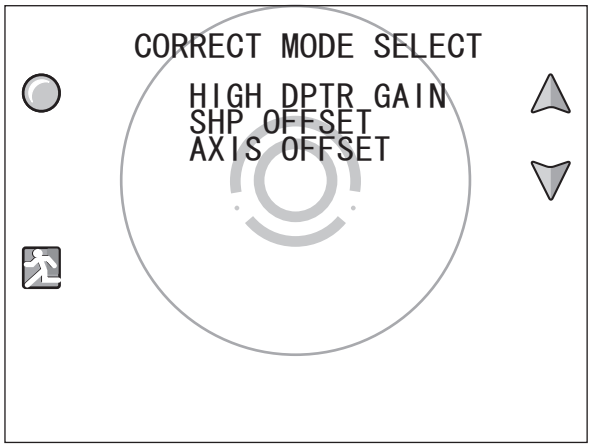
8. After the calibration is completed, “AR AXIS CALIB OK” is displayed.
9. Turn off the power after the AR AXIS calibration is completed.
10. Enter the measurement mode (see 7.1.4).
11. Press the auto button and select 3D auto-tracking [3D] and auto-shot [A].
 * For the AR-310A and ARK-510A, the indication of auto-tracking is [⇕].
12. Confirm that the measured value for each angle (0º, 45º, 90º, 135º) of the cylinder axis adjustment jig is each angle ±3º.



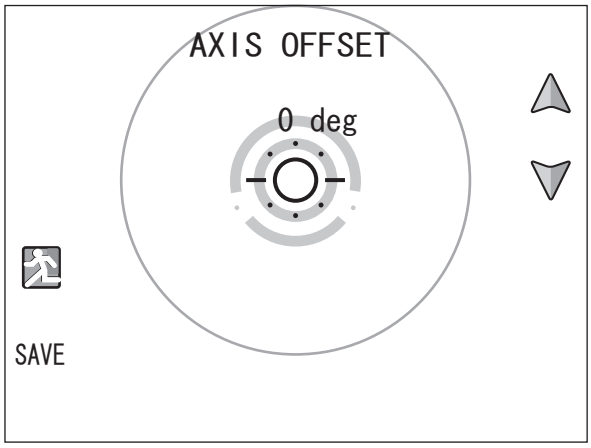
13. After adjustment is completed, press the exit button to turn off the power.
14. When the measured value is out of the specifications, perform AXIS OFFSET (see 7.6.3).

7.6.3 AXIS OFFSET

1. Attach the chinrest attachment jig (32107-1100) and cylinder axis adjustment jig (32177-1500) (see 7.6.2).
2. Display the CALIB MODE SELECT (for AR) screen (see 7.1.2).
3. Select AR CORRECT with the up △ or down ▽ button and press the set button ○.
4. Select AXIS OFFSET with the up △ or down ▽ button and press the set button ○.



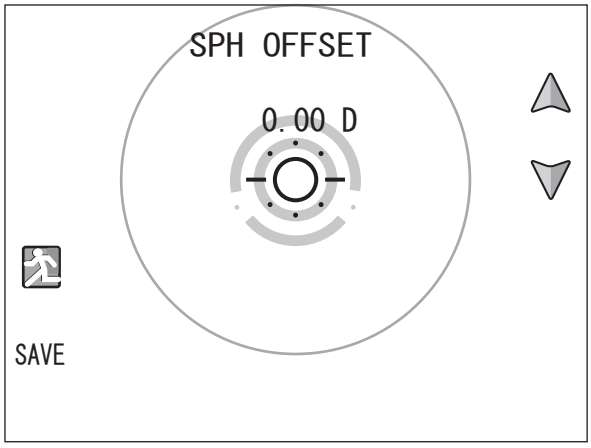
5. Change the numeric value with the up △ or down ▽ button.
6. Press the SAVE button to save the setting.
7. Turn off the power.
8. Enter the measurement mode (see 7.1.4).
9. Confirm that the measured value for each angle (0º, 45º, 90º, 135º) of the cylinder axis adjustment jig is each angle ±3º.
10. After adjustment is completed, press the exit button twice to turn off the power.



7.6.4 SPH OFFSET

* Change the SPH OFFSET values only when the AR measurement values differ by the same amount.

1. Display the CALIB MODE SELECT (for AR) screen (see 7.1.2).
2. Select AR CORRECT with the up △ or down ▽ button and press the set button ○.
3. Select SPH OFFSET with the up △ or down ▽ button and press the set button ○.
4. Change the numeric value with the up △ or down ▽ button.
5. Press the SAVE button to save the setting.
6. When the measured value for 0.00 D is -4.00 D, changing the numeric value results in as below.
 1) When the numeric value is changed to +0.50 D, the measured value becomes -3.50 D.
 2) When the numeric value is changed to -0.50 D, the measured value becomes -4.50 D.



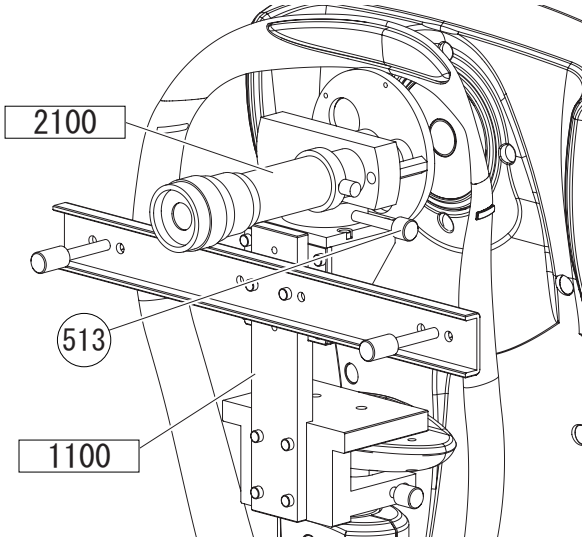
7. After adjustment is completed, press the exit button twice to turn off the power.

7.6.5 Chart calibration (*Adjustable only in factory)

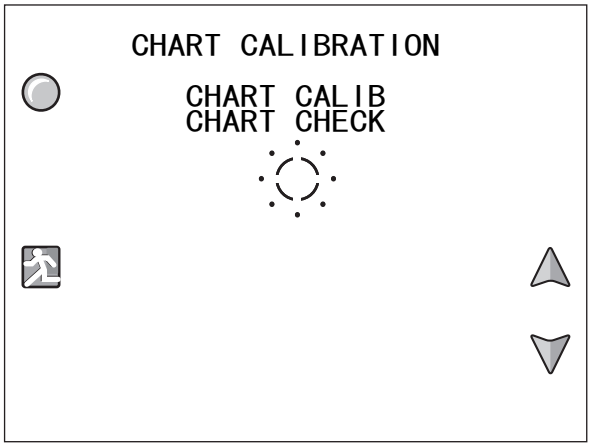
7.6.5.1 Attaching jigs

7.6.5.1.1 Chart inspection jig (32145-2100)

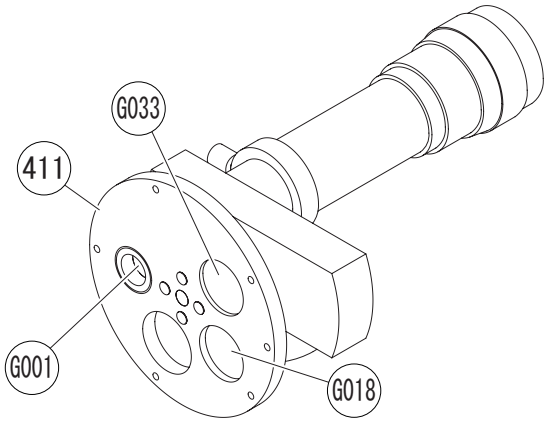
1. Attach the jigs as follows:
 1) Attach the chinrest attachment jig (32107-1100) (see 7.5).
 2) Attach the chart inspection jig (32145-2100) to the chinrest attachment jig (32107-1100).
 * Fix the jig with the knob (32177-M513).



2. Display the CALIB MODE SELECT (for AR) screen (see 7.1.2).
3. Select CHART with the up △ or down ▽ button, then press the set button ○.
4. Select CHART CALIB with the up △ or down ▽ button, then press the set button ○.

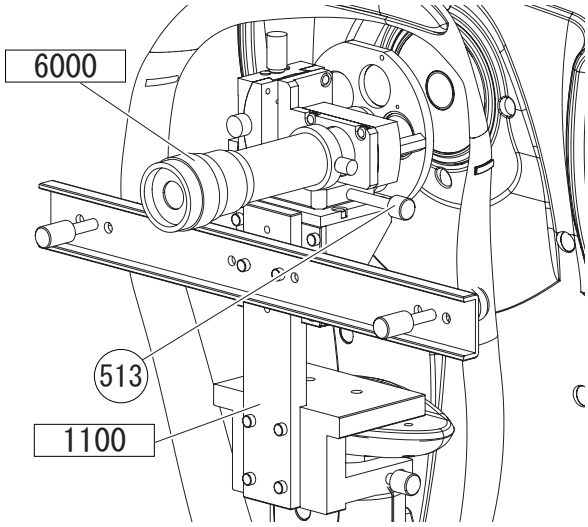


5. Turn the turret plate (32145-M441) of the chart inspection jig to select the model eye convex lens (32527-G001).
6. Align the model eye convex lens (32527-G001) so that the focusing indicator displays the optimum condition.
7. Fix the measuring unit with the fixing lever.
 * Fix the unit while the focusing indicator is in the optimum condition.

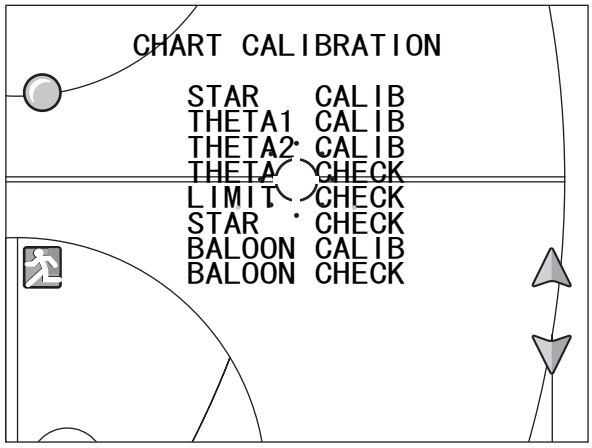


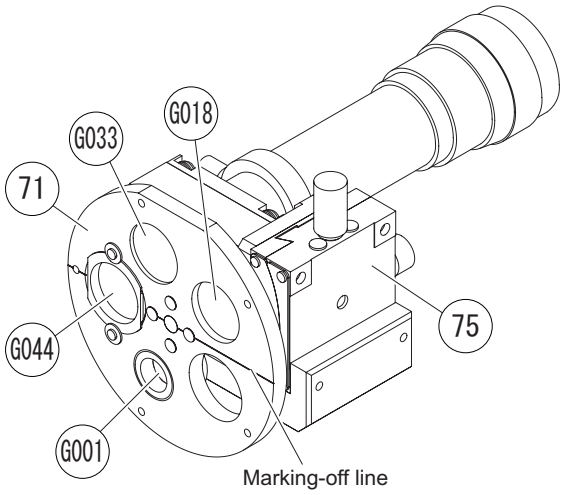
7.6.5.1.2 Chart inspection jig (30670-2300)

1. Attach the jigs as follows:
 1) Attach the chinrest attachment jig (32107-1100) (see 7.5).
 2) Attach the chart inspection jig (30670-2300) to the chinrest attachment jig (32107-1100).
 * Fix the jig with the knob (32177-M513).



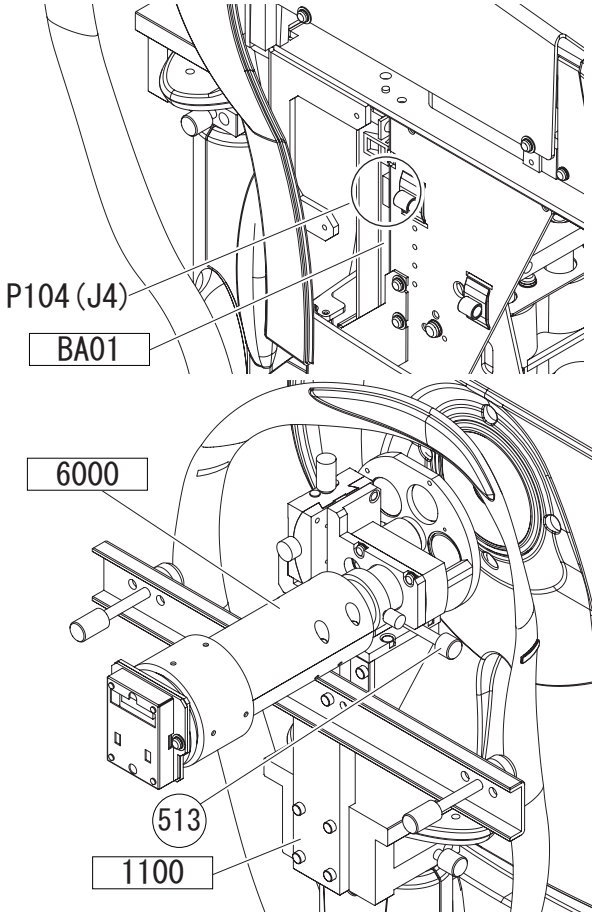
 3) Display the CALIB MODE SELECT (for AR) screen (see 7.1.2).
 4) Select CHART with the up △ or down ▽ button, then press the set button ○.
 5) Make the chart inspection jig (30670-2300) level while aligning the marking-off line with the target using the dovetail goniostage (30670-M075).
2. Select STAR CALIB with the up △ or down ▽ button, then press the set button ○.
3. Turn the turret plate (30670-M071) of the chart inspection jig (30670-2300) to select the model eye convex lens (32527-G001).
4. Align the model eye convex lens (32527-G001) so that the focusing indicator displays the optimum condition.
5. Fix the measuring unit with the fixing lever.
 * Fix the unit while the focusing indicator is in the optimum condition.
 * Maintain the alignment of the convex lens during adjustment.

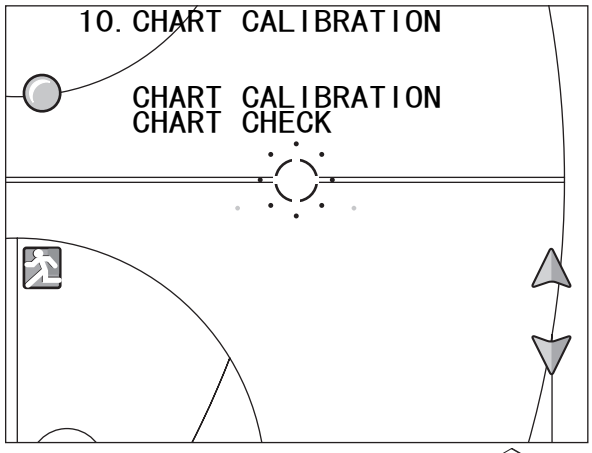


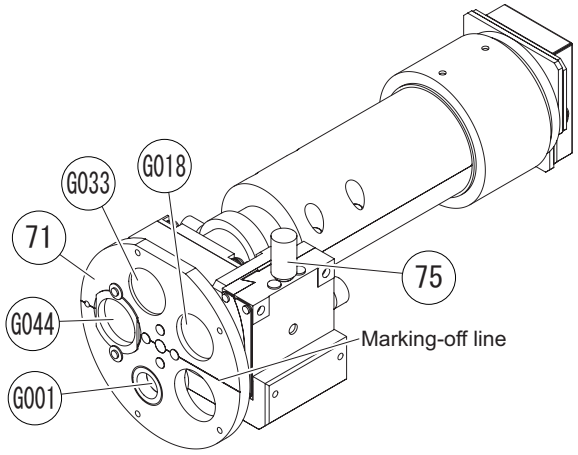


7.6.5.1.3 Dioptric tester jig (30670-6000)

1. Attach the dioptric tester jig ASSY. (30670-6000) as follows:
 1) Remove the measuring unit left cover (30601-M707) (see 5.1).
 2) Disconnect connector P104 (J4) from the main board.
 a. AR-310A : 30601-BA01P
 b. AR-330A : 30602-BA01P
 c. AR-360A : 30603-BA01P
 a. ARK-510A : 30701-BA01P
 b. ARK-530A : 30702-BA01P
 c. ARK-560A : 30703-BA01P
 3) Attach the chinrest attachment jig (32107-1100) (see 7.5).
 4) Attach the dioptric tester jig ASSY. (30670-6000) to the chinrest attachment jig (32107-1100).
 * Fix the jig with the knob (32177-M513).
 5) Connect the connector of the dioptric tester jig ASSY. (30670-6000) to connector P104 (J4) of the main board.
 6) Enter the MENU mode to select 10 CHART POSITION (see 7.1.1).
 7) Make the dioptric tester jig ASSY. (30670-6000) level while aligning the marking-off line with the target using the dovetail goniostage (30670-M075).
2. Turn the turret plate (30670-M071) of the dioptric tester jig ASSY. (30670-6000) to select the model eye convex lens (32527-G001).
3. Align the model eye convex lens (32527-G001) so that the focusing indicator displays the optimum condition.
4. Fix the measuring unit with the fixing lever.
 * Fix the unit while the focusing indicator is in the optimum condition.





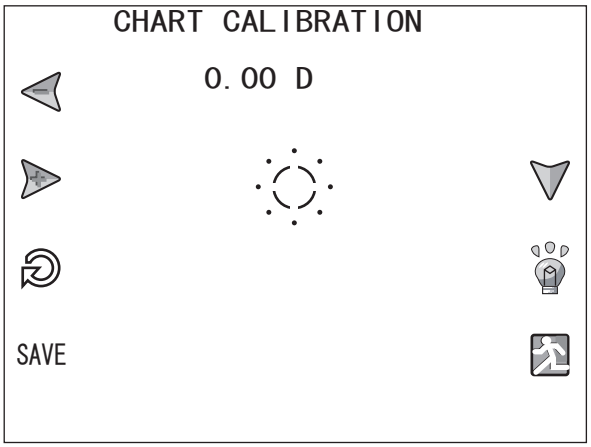


7.6.5.2 AR-310A, AR-330A, ARK-510A, ARK-530A

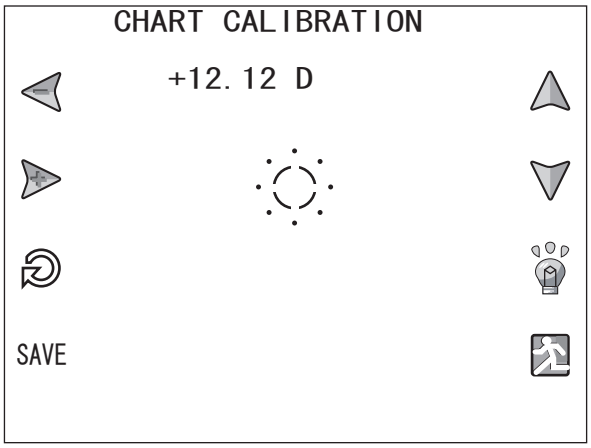
7.6.5.2.1 Chart calibration when using chart inspection jig

* If the adjustment jig is not available, return the device to the factory without performing adjustment.

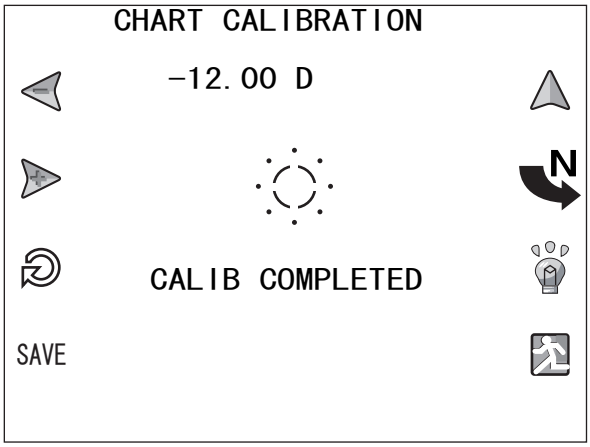
1. Attach the chart inspection jig (32145-2100 or 30670-2300) (see 7.6.5.1.1 or 7.6.5.1.2).
2. Perform the chart calibration as follows:
 1) Adjust the 0 D position according to the steps below.
 a. Turn the turret plate to select a position without any lens.
 b. Press the right+ button until the whole chart is focused for the first time.
 c. Press the SAVE button to save the 0 D position.



 2) Press the down button and adjust the +12.12 D position according to the steps below.
 a. Turn the turret plate to select the +12.00 D (33510-G033) lens.
 b. Press the right+ button until the whole chart is focused for the first time.
 c. Press the SAVE button to save the +12.12 D position.



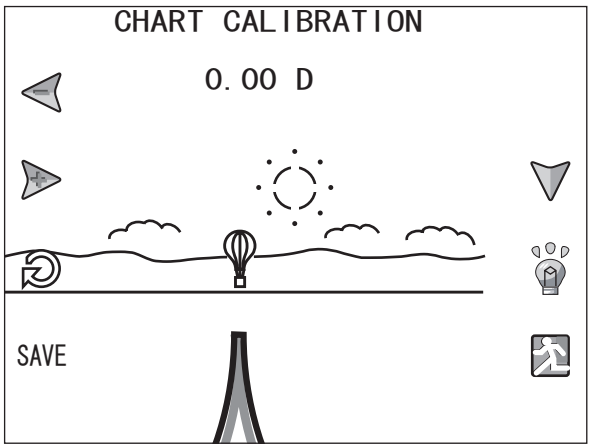
 3) Press the down button and adjust the -12.00 D position according to the steps below.
 a. Turn the turret plate to select the -12.00 D (33510-G018) lens.
 b. Press the left- button until the whole chart is focused for the first time.
 c. Press the SAVE button to save the -12.00 D position.
 * Pressing the SAVE button displays the next button N.
3. Press the next button N to display the CHART CHECK screen.
4. Perform CHART CHECK (see 7.6.6).



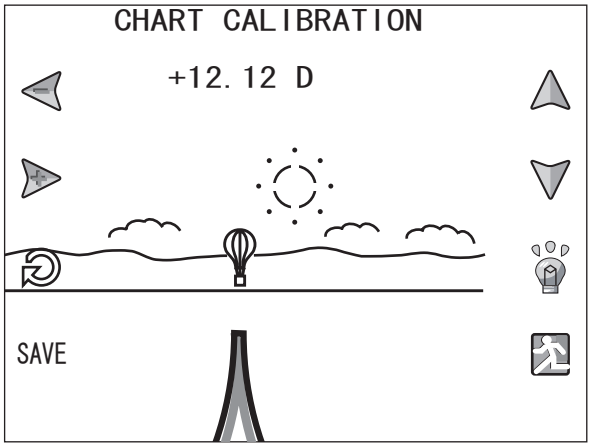
7.6.5.2.2 Chart calibration when using dioptric tester jig ASSY.

* If the adjustment jig is not available, return the device to the factory without performing adjustment.

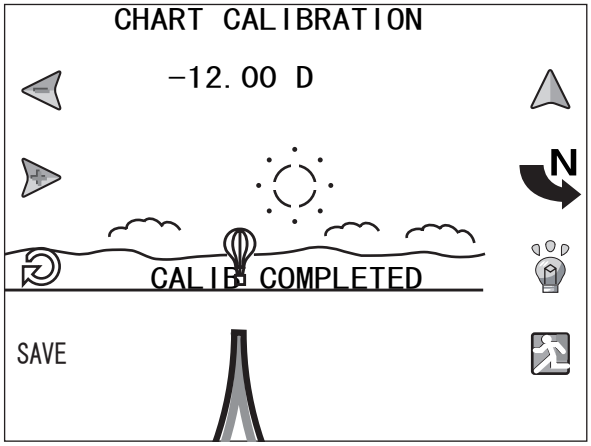
1. Attach the dioptric tester jig ASSY. (30670-6000) (see 7.6.5.1.3).
2. Perform the chart calibration as follows:
 1) Select CHART CALIBRATION with the up △ or down ▽ button, then press the set button ○.
 2) Adjust the 0 D position according to the steps below.
 a. Turn the turret plate to select a position without any lens.
 b. Press the right+ button ▷ until the whole chart is focused for the first time.
 c. Press the SAVE button to save the 0 D position.



 3) Press the down button ▽ and adjust the +12.12 D position according to the steps below.
 a. Turn the turret plate to select the +12.00 D (33510-G033) lens.
 b. Press the right+ button ▷ until the whole chart is focused for the first time.
 c. Press the SAVE button to save the +12.12 D position.

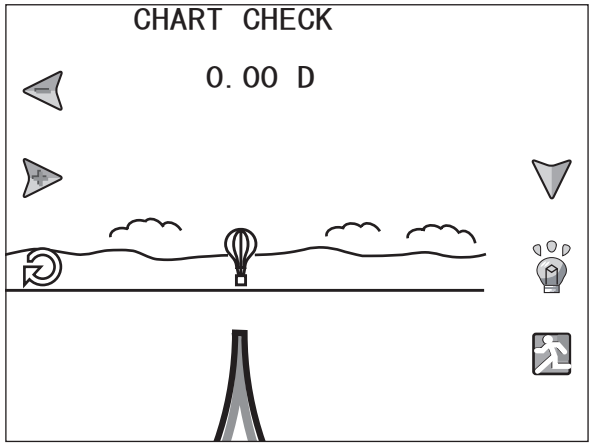


 4) Press the down button ▽ and adjust the -12.00 D position according to the steps below.
 a. Turn the turret plate to select the -12.00 D (33510-G018) lens.
 b. Press the left- button ◁ until the whole chart is focused for the first time.
 c. Press the SAVE button to save the -12.00 D position.
 * Pressing the SAVE button displays the next button N.

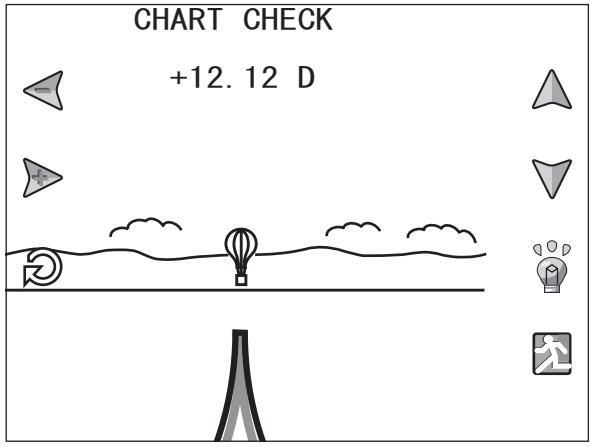


3. Press the next button N to display the CHART CHECK screen.

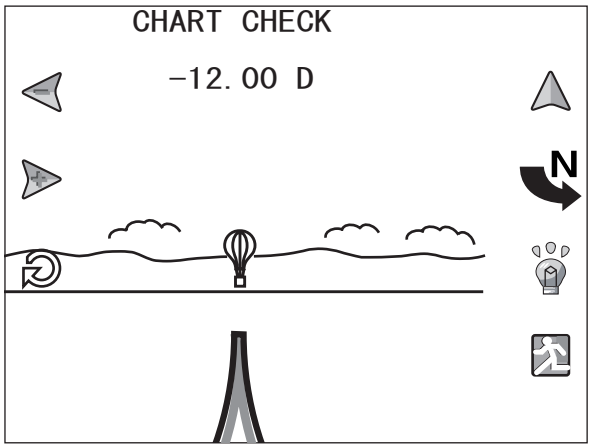
4. Perform CHART CHECK as follows:
 1) Check the 0 D position according to the steps below.
 a. Turn the turret plate to select a position without any lens.
 b. Press the left- button ◁ or right+ button ▷ several times.
 c. Perform adjustment with the left- button ◁ or right+ button ▷ so that the whole chart is focused.
 d. Press the start button and confirm that the displayed numeric value is 0 D ±0.25 D.



 2) Press the down button ▽ and adjust the +12.12 D position according to the steps below.
 a. Turn the turret plate to select the +12.00 D (33510-G033) lens.
 b. Press the left- button ◁ or right+ button ▷ several times.
 c. Perform adjustment with the left- button ◁ or right+ button ▷ so that the whole chart is focused.
 d. Press the start button and confirm that the displayed numeric value is +12.12 D ±0.25 D.



 3) Press the down button ▽ and adjust the -12.00 D position according to the steps below.
 a. Turn the turret plate to select the -12.00 D (33510-G018) lens.
 b. Press the left- button ◁ or right+ button ▷ several times.
 c. Perform adjustment with the left- button ◁ or right+ button ▷ so that the whole chart is focused.
 d. Press the start button and confirm that the displayed numeric value is -12 D ±0.25 D.



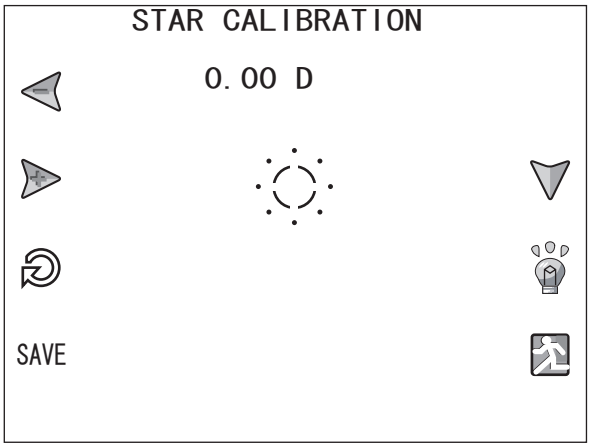
5. Press the next button N to display the CALIBRATION FINISH screen.
6. When “PLEASE SHUT OFF” is displayed, turn off the power switch.
7. Remove the chinrest attachment jig (32107-1100) and dioptric tester jig ASSY. (30670-6000) in reverse order.

7.6.5.3 AR-360A, ARK-560A

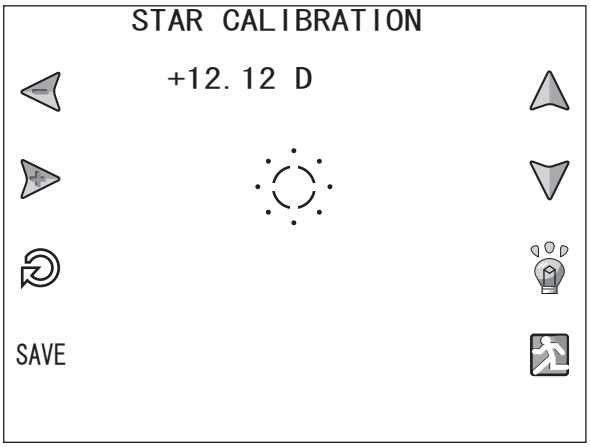
7.6.5.3.1 Chart calibration when using chart inspection jig

* If the adjustment jig is not available, return the device to the factory without performing adjustment.

1. Attach the chart inspection jig (30670-2300) (see 7.6.5.1.2).
2. Perfrom the STAR CALIBRATION as follows:
 1) Adjust the 0 D position according to the steps below.
 a. Turn the turret plate to select a position without any lens.
 b. Press the right+ button until the whole clock dial chart is focused for the first time.
 c. Press the SAVE button to save the 0 D position.

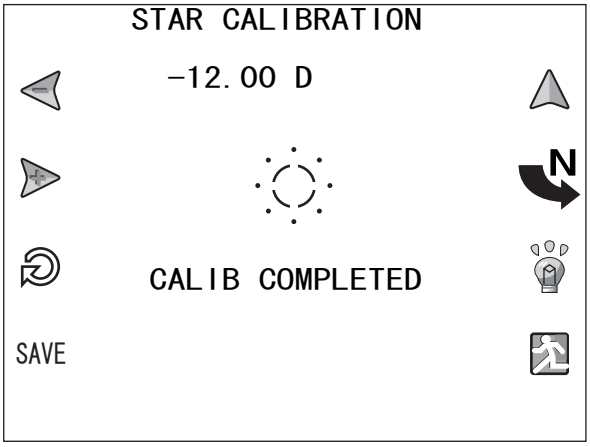


 2) Press the down button and adjust the +12.12 D position according to the steps below.
 a. Turn the turret plate to select the +12.00 D (33510-G033) lens.
 b. Press the right+ button until the whole clock dial chart is focused for the first time.
 c. Press the SAVE button to save the +12.12 D position.



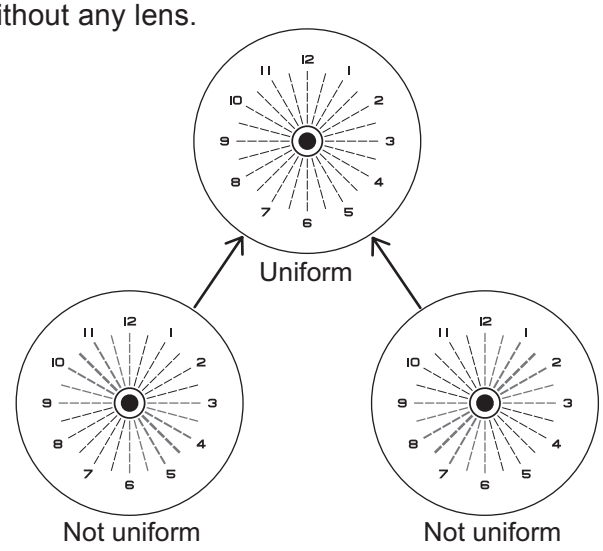
 3) Press the down button and adjust the -12.00 D position according to the steps below.
 a. Turn the turret plate to select the -12.00 D (33510-G018) lens.
 b. Press the left- button until the whole clock dial chart is focused for the first time.
 c. Press the SAVE button to save the -12.00 D position.

 * Pressing the SAVE button displays the next button N.

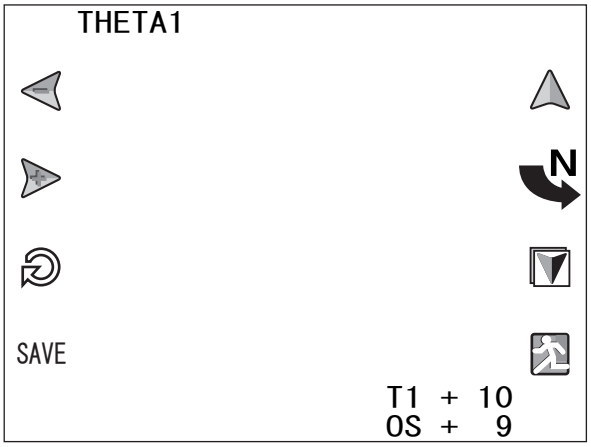


3. Press the next button N to display the THETA1 CALIB screen.

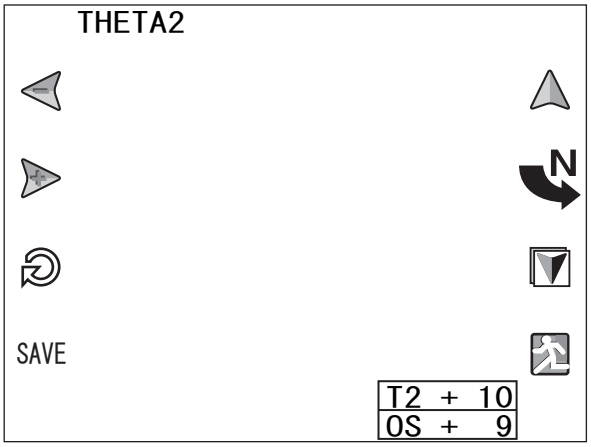
4. Perform THETA1 CALIB as follows:
 1) Turn the turret plate to select a position without any lens.
 2) Perform adjustment with the left- button ◁ or right+ button ▷ so that the clock dial chart can be seen in uniform clarity.



 3) Press the SAVE button to save the position.
 * Pressing the SAVE button displays the next button N.
 4) Press the page down button ▽ to confirm that the chart is seen in uniform clarity at every angle.
 * Pressing the page down button ▽ turns the subjective cylinder ASSY. up to 180º by increments of 45º.
 * Pressing the page down button ▽ five times returns to the original position.
 5) If the chart is not focused at every angle, restart from 2) for readjustment.
5. Press the NEXT button N to display the THETA2 CALIB screen.

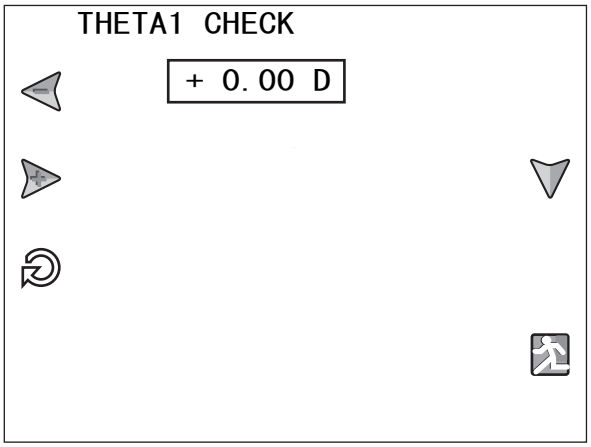


6. Perform THETA2 CALIB as follows:
 1) Turn the turret plate to select the -5.36D CYL (33510-G044) lens.
 2) Press the page down button ▽ to select OFFSET.
 * The indication of “OS” turns red.
 3) Perform adjustment with the left- button ◁ and right+ button ▷ so that the clock dial chart can be seen in uniform clarity.
 4) Press the page down button ▽ to select THETA2.
 * The indication of “T2” turns red.
 5) Perform adjustment with the left- button ◁ and right+ button ▷ so that the clock dial chart can be seen in uniform clarity.
 6) Perform 2) to 5) twice.
 7) Press the SAVE button to save the position.
 * Pressing the SAVE button displays the NEXT button N.

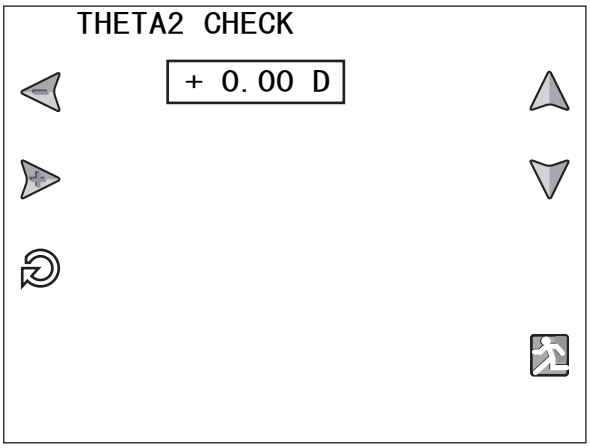


7. Press the up button △ to perform readjustment from STAR CALIBRATION in Step 6.
 * When adjustment values for the THETA1 and THETA2 calibrations are substantially changed, perform Step 6 to 10 twice.
8. Press the NEXT button N to display the THETA1 CHECK screen.

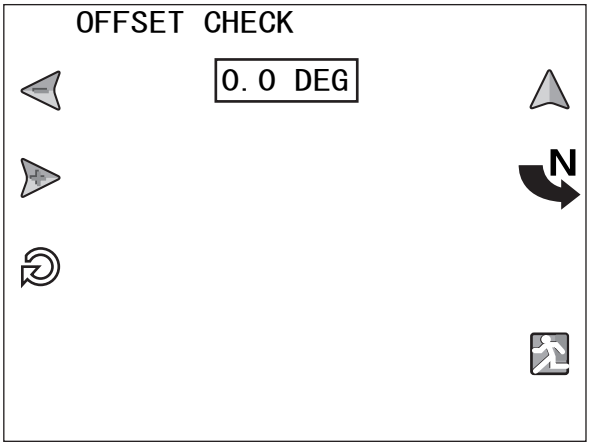
9. Perform THETA1 CHECK as follows:
 1) Turn the turret plate to select a position without any lens.
 2) Press the left- button ◁ or right+ button ▷ several times.
 3) Perform adjustment with the left- button ◁ or right+ button ▷ so that the clock dial chart can be seen in uniform clarity.
 4) Press the start button to confirm that the displayed numeric value is within ±0.25 D.
 5) When the numeric value is not within ±0.25 D, press the exit button and restart from THETA1 CALIB in Step 4.



10. Press the down button ▽ to display the THETA2 CHECK screen.
11. Perform THETA2 CHECK as follows:
 1) Turn the turret plate to select the -5.36D CYL (33510-G044) lens.
 2) Press the left- button ◁ or right+ button ▷ several times.
 3) Perform adjustment with the left- button ◁ or right+ button ▷ so that the clock dial chart can be seen in uniform clarity.
 4) Press the start button to confirm that the displayed numeric value is within ±0.25 D.
 5) When the numeric value is not within ±0.25 D, press the exit button and restart from THETA2 CALIB in Step 6.

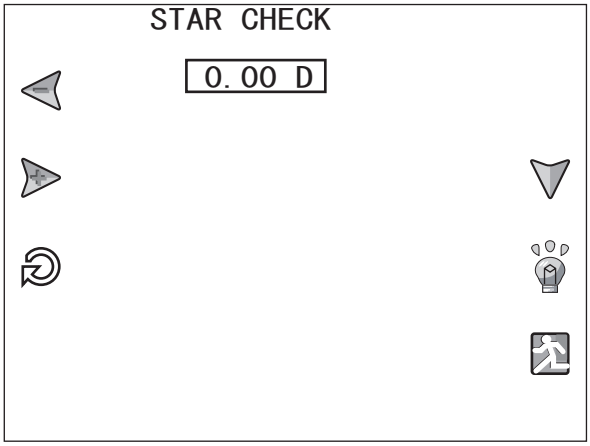


12. Press the down button ▽ to display the OFFSET CHECK screen.
13. Perform OFFSET CHECK as follows:
 1) Turn the turret plate to select the -5.36 D CYL (33510-G044) lens.
 2) Press the left- button ◁ or right+ button ▷ several times.
 3) Perform adjustment with the left- button ◁ or right+ button ▷ so that the clock dial chart can be seen in uniform clarity.
 4) Press the start button to confirm that the displayed numeric value is within ±3 DEG.
 5) When the numeric value is not within ±3 DEG, press the exit button and restart from THETA2 CALIB in Step 6.

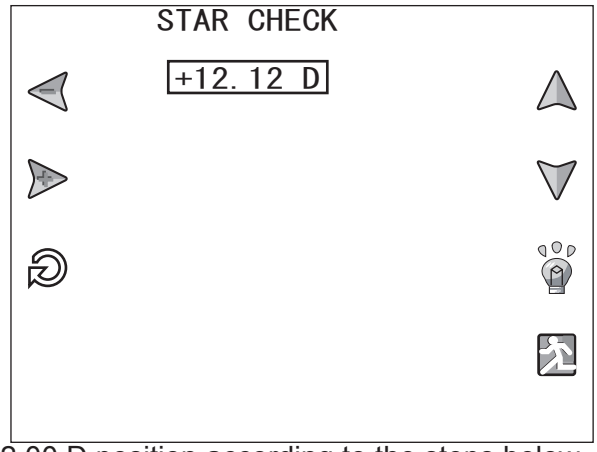


14. Press the next button N to display the CHECK CYL LIMIT screen.
15. Confirm that “CHECK OK” is displayed.
16. Press the next button N to return to the STAR CALIBRATION screen.

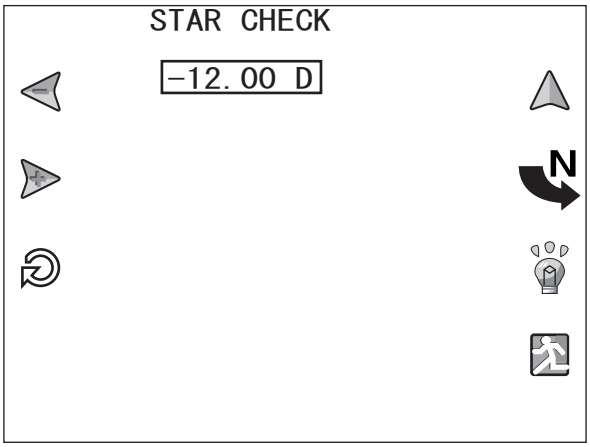
17. Perform STAR CHECK as follows:
 1) Select STAR CHECK with the up ▲ or down ▼ button, then press the set button ●.
 2) Check the 0 D position according to the steps below.
 a. Turn the turret plate to select a position without any lens.
 b. Perform adjustment with the left- button ◀ or right+ button ▶ so that the whole clock dial chart is focused.
 c. Press the start button to confirm that the displayed numeric value is 0 D ±0.25 D.



 3) Press the down button ▼ and check the +12.12 D position according to the steps below.
 a. Turn the turret plate to select the +12.00 D (33510-G033) lens.
 b. Perform adjustment with the left- button ◀ or right+ button ▶ so that the whole clock dial chart is focused.
 c. Press the start button to confirm that the displayed numeric value is +12.12 D ±0.25 D.

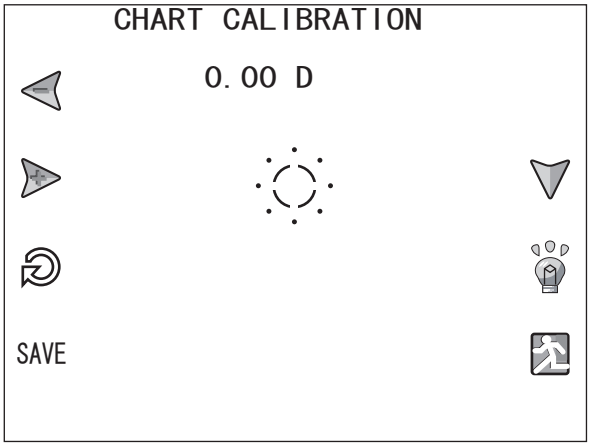


 4) Press the down button ▼ and check the -12.00 D position according to the steps below.
 a. Press the down button ▼.
 b. Turn the turret plate to select the -12.00 D (33510-G018) lens.
 c. Perform adjustment with the left- button ◀ or right+ button ▶ so that the whole clock dial chart is focused.
 d. Press the start button to confirm that the displayed numeric value is -12 D ±0.25 D.

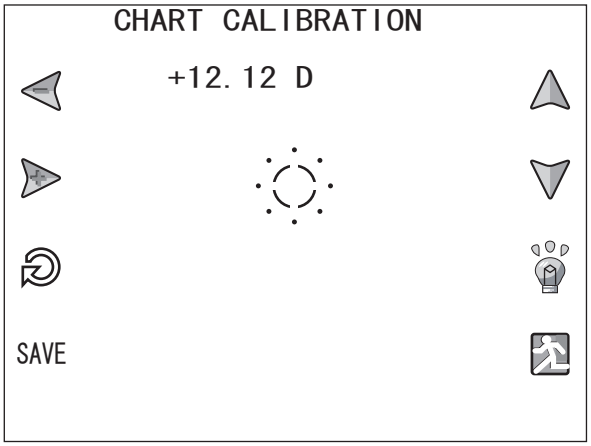


18. Press the next button N to display the BALOON CALIB screen.

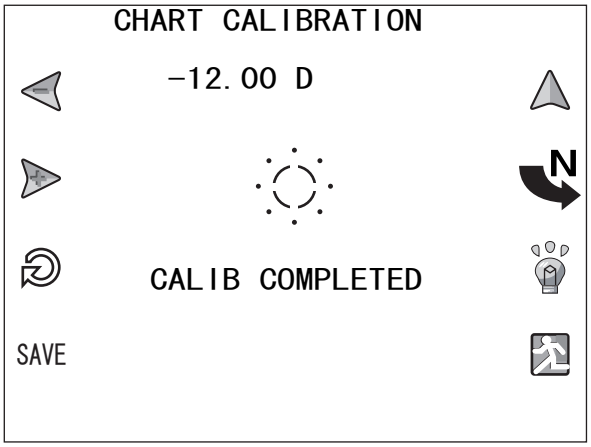
19. Perform BALOON CALIB as follows:
 1) Adjust the 0 D position according to the steps below.
 a. Turn the turret plate to select a position without any lens.
 b. Press the right+ button until the whole chart is focused for the first time.
 c. Press the SAVE button to save the 0 D position.



 2) Press the down button and adjust the +12.12 D position according to the steps below.
 a. Turn the turret plate to select the +12.00 D (33510-G033) lens.
 b. Press the right+ button until the whole scenery chart is focused for the first time.
 c. Press the SAVE button to save the +12.12 D position.

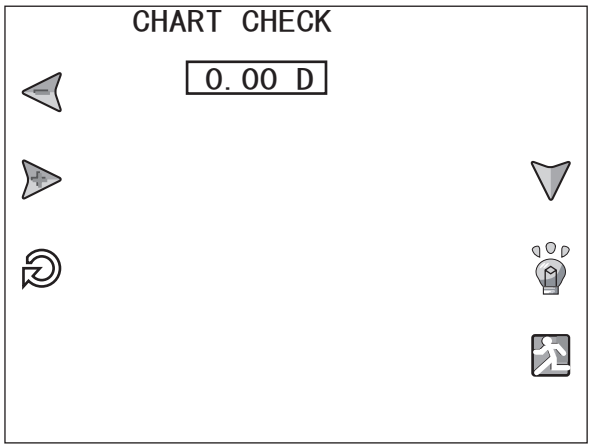


 3) Press the down button and adjust the -12.00 D position according to the steps below.
 a. Turn the turret plate to select the -12.00D (33510-G018) position.
 b. Press the left- button until the whole scenery chart is focused for the first time.
 c. Press the SAVE button to save the -12.00 D position.
 * Pressing the SAVE button displays the next button N.

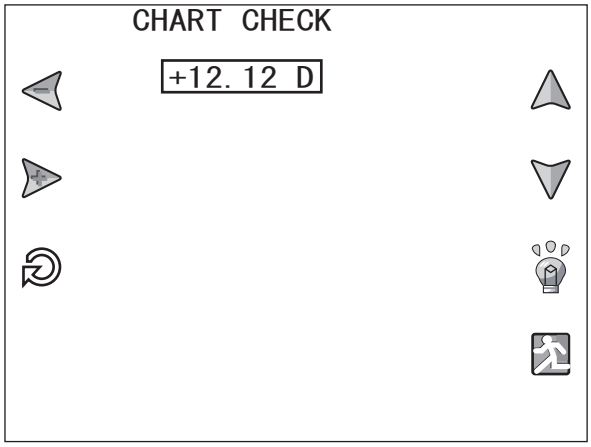


20. Press the next button N to display the BALOON CHECK screen.

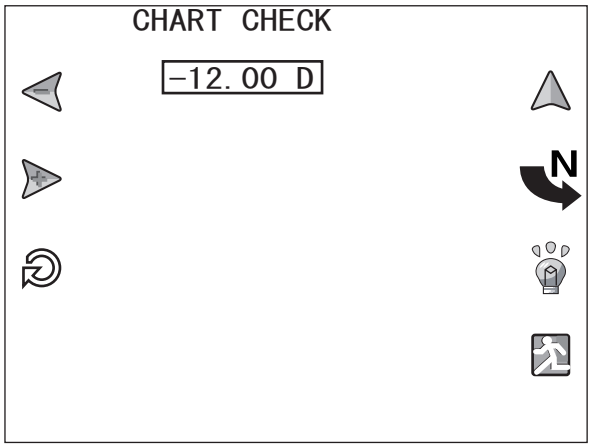
21. Perform BALOON CHECK as follows:
 1) Check the 0 D position according to the steps below.
 a. Turn the turret plate to select a position without any lens.
 b. Press the left- button ◁ or right+ button ▷ several times.
 c. Perform adjustment with the left- button ◁ or right+ button ▷ so that the whole scenery chart is focused.
 d. Press the start button to confirm that the displayed numeric value is 0 D ±0.25 D.



 2) Press the down button ▽ and check the +12.12 D position according to the steps below.
 a. Turn the turret plate to select the +12.00 D (33510-G033) lens.
 b. Press the left- button ◁ or right+ button ▷ several times.
 c. Perform adjustment with the left- button ◁ or right+ button ▷ so that the whole scenery chart is focused.
 d. Press the start button to confirm that the displayed numeric value is +12.12 D ±0.25 D.



 3) Press the down button ▽ and check the -12.00 D position according to the steps below.
 a. Turn the turret plate to select the -12.00 D (33510-G018) lens.
 b. Press the left- button ◁ or right+ button ▷ several times.
 c. Perform adjustment with the left- button ◁ or right+ button ▷ so that the whole scenery chart is focused.
 d. Press the start button to confirm that the displayed numeric value is -12 D ±0.25 D.

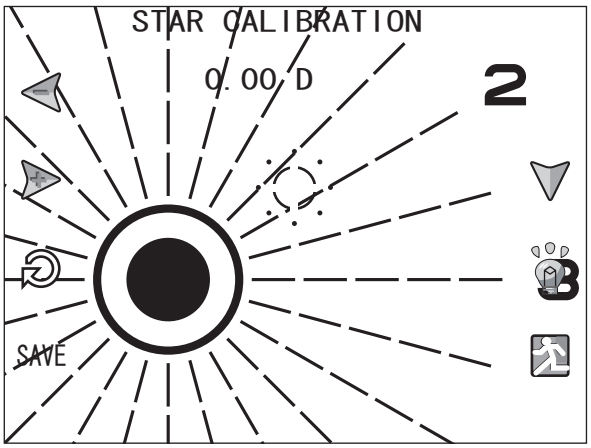


22. Press the next button N.
23. Enter the CALIBRATION FINISH screen. When “PLEASE SHUT OFF” is displayed, turn off the power switch.
24. Remove the chinrest attachment jig (32107-1100) and chart inspection jig (30670-2300).

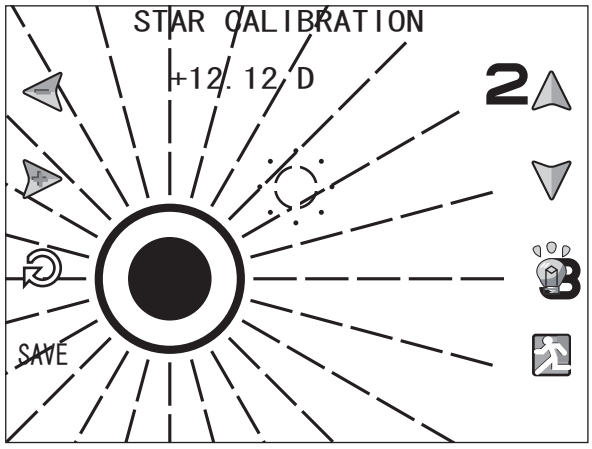
7.6.5.3.2 Chart calibration when using dioptric tester jig ASSY.

* If the adjustment jig is not available, return the device without performing adjustment.

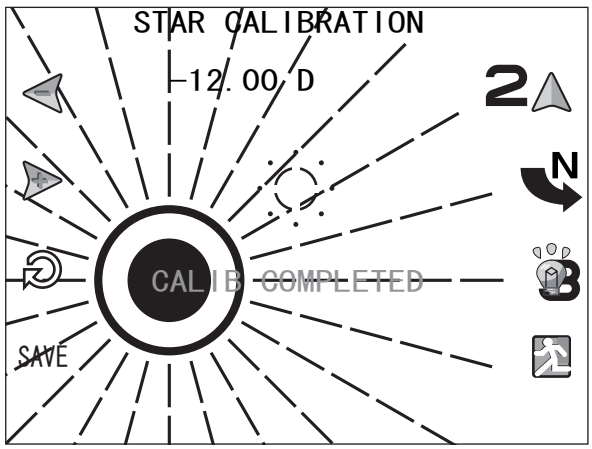
1. Attach the dioptric tester jig ASSY. (30670-6000) (see 7.6.5.1.3).
2. Perform STAR CALIBRATION as follows.
 1) Select STAR CALIB with the up ▲ or down ▼ button, then press the set button ◯.
 2) Press the reset button ↺ to change the camera.
 3) Adjust the 0 D position according to the steps below.
 a. Turn the turret plate to select the position without any lens.
 b. Press the right+ button ▶ until the whole clock dial chart is focused for the first time.
 c. Press the SAVE button to save the 0 D position.



 4) Press the down button ▼ and adjust the +12.12 D position according to the steps below.
 a. Turn the turret plate to select the +12.00 D (33510-G033) position.
 b. Press the right+ button ▶ until the whole clock dial chart is focused for the first time.
 c. Press the SAVE button to save the +12.12 D position.

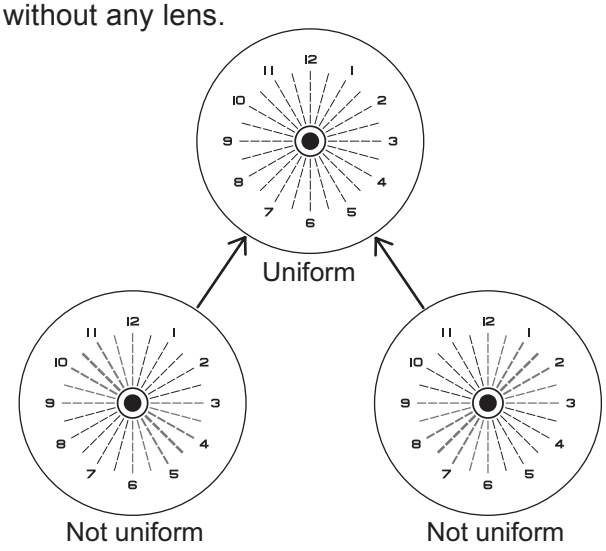


 5) Press the down button ▼ and adjust the -12.00 D position according to the steps below.
 a. Turn the turret plate to select the -12.00 D (33510-G018) position.
 b. Press the left- button ◀ until the whole clock dial chart is focused for the first time.
 c. Press the SAVE button to save the -12.00 D position.
 * Pressing the SAVE button displays the next button N.

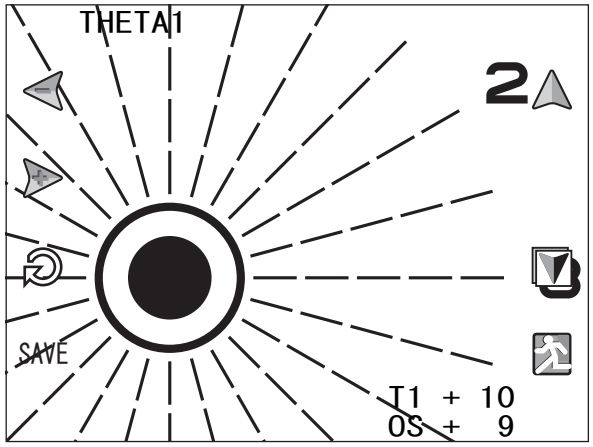


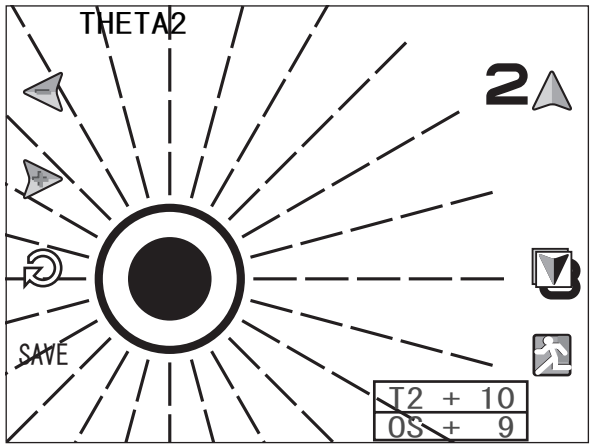
3. Press the next button N to display the THETA1 CALIB screen.

4. Perform THETA1 CALIB as follows:
 1) Turn the turret plate to select the position without any lens.
 2) Perform adjustment with the left- button ◁ and right+ button ▷ so that the whole clock dial chart is focused.



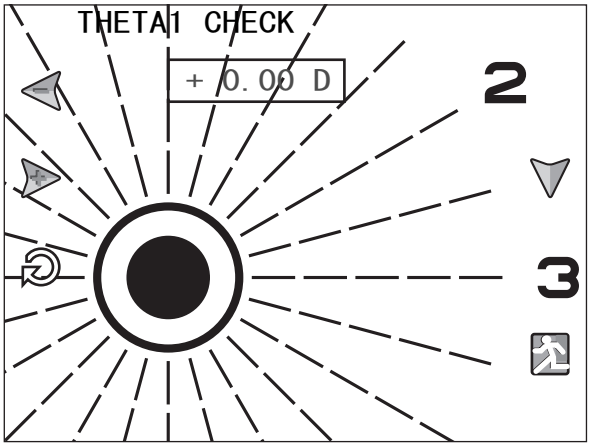
 3) Press the SAVE button to save the position.
 * Pressing the SAVE button displays the next button N.
 4) Press the page down button ▽ to confirm that the whole chart is focused at each angle.
 * Pressing the page donw button ▽ turns the subjective cylinder ASSY. up to 180º by increments of 45º.
 * Pressing the page down button ▽ five times returns to the original position.
 5) If the chart is not focused at all angles, restart from 2) for readjustment.
5. Press the next button N to display the THETA2 CALIB screen.
6. Perform THETA2 CALIB according to the steps below.
 1) Turn the turret plate to select the -5.36 D CYL (33510-G044) lens.
 2) Press the page down ▽ button to select OFFSET.
 * The indication of “OS” turns red.
 3) Perform adjustment with the left- button ◁ and right+ button ▷ so that the whole clock dial chart is focused.
 4) Press the page down button ▽ to select THETA2.
 * The indication of “T2” turns red.
 5) Perform adjustment with the left- button ◁ and right+ button ▷ so that the whole clock dial chart is focused.
 6) Perform 2) to 5) again.
 7) Press the SAVE button to save the position.
 * Pressing the SAVE button displays the next button N.



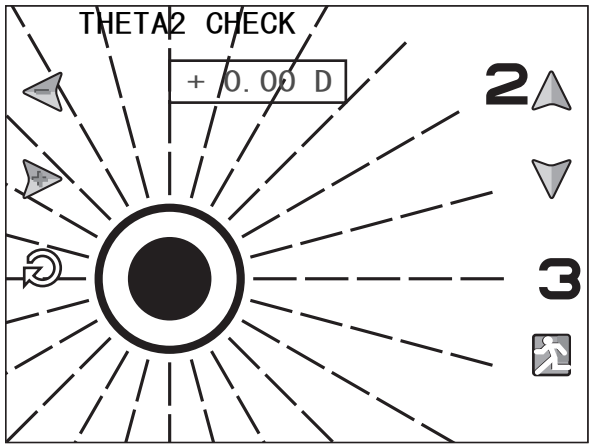


7. Press the up button △ to restart from STAR CALIBRATION in Step 6.
 * When the adjustment values for the THETA1 and THETA2 calibrations are changed substantially, perform the procedures from STAR CALIBRATION in Step 5 twice.
8. Press the next button N to display the THETA1 CHECK screen.

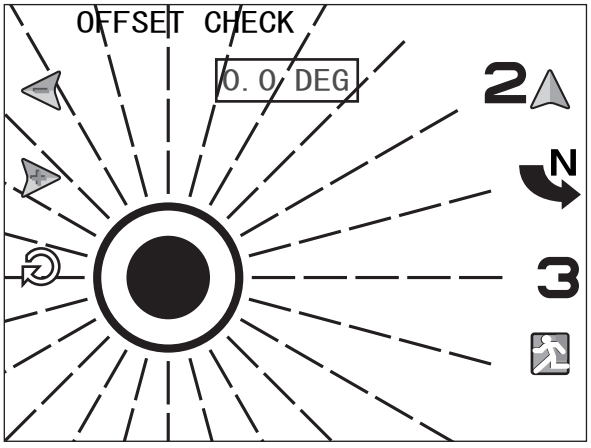
9. Perform THETA1 CHECK as follows:
 1) Turn the turret plate to select the position without any lens.
 2) Press the left- button ◁ or right+ button ▷ several times.
 3) Perform adjustment with the left- button ◁ or right+ button ▷ so that the whole clock dial chart can be seen in uniform clarity.
 4) Press the start button to confirm that the displayed numeric value is within ±0.25 D.
 5) When the value is not within ±0.25 D, press the exit button and restart from THETA1 CALIB in Step 4.



10. Press the down button ▽ to display the THETA2 CHECK screen.
11. Perform THETA2 CHECK as follows:
 1) Turn the turret plate to select the -5.36 D CYL (33510-G044) lens.
 2) Press the left- button ◁ or right+ button ▷ several times.
 3) Perform adjustment with the left- button ◁ or right+ button ▷ so that the whole clock dial chart can be seen in unifrom clarity.
 4) Press the start button to confirm that the displayed numeric value is within ±0.25 D.
 5) When the value is not within ±0.25 D, press the exit button and restart from THETA2 CALIB in Step 6.

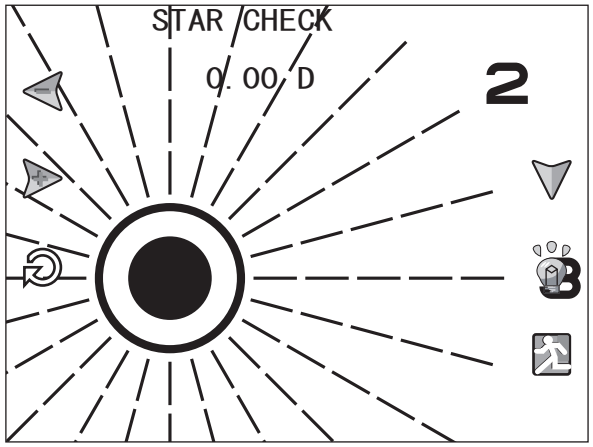


12. Press the down button ▽ to display the OFFSET CHECK screen.
13. Perform OFFSET CHECK as follows:
 1) Turn the turret plate to select the position without any lens.
 2) Press the left- button ◁ or right+ button ▷ several times.
 3) Perform adjustment with the left- button ◁ or right+ button ▷ so that the whole clock dial chart can be seen in uniform clarity.
 4) Press the start button to confirm that the displayed numeric value is within ±3 DEG.
 5) When the value is not within ±3 DEG, press the exit button and restart from THETA2 CALIB in Step 6.

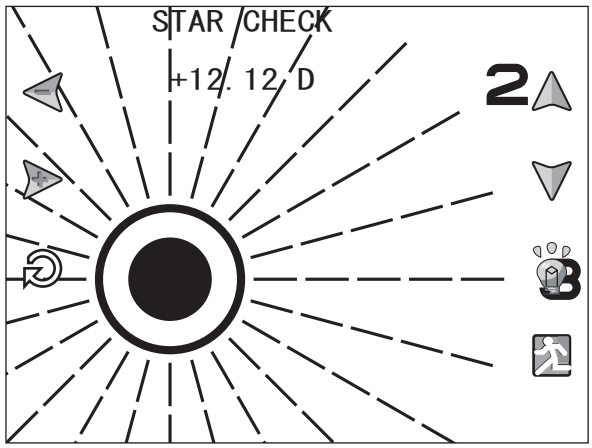


14. Press the next button N to enter the CHECK CYL LIMIT screen.
15. Confirm that “CHECK OK” is displayed.
16. Press the next button N to display the STAR CHECK screen.

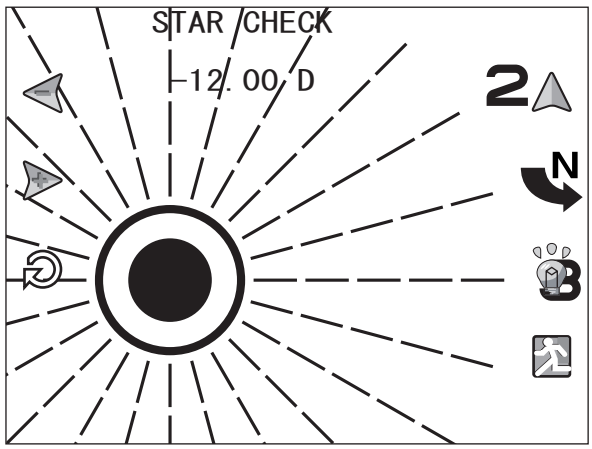
17. Perform STAR CHECK as follows:
 1) Select STAR CHECK with the up ▲ or down ▼ button, then press the set button ●.
 2) Check the 0 D position according to the steps below.
 a. Turn the turret plate to select a position without any lens.
 b. Press the left- button ◀ or right+ button ▶ several times.
 c. Perform adjustment with the left- button ◀ or right+ button ▶ so that the whole chart is focused.
 d. Press the start button to confirm that the displayed numeric value is 0 D ±0.25 D.



 3) Press the down button ▼.
 4) Check the +12.12 D position according to the steps below.
 a. Turn the turret plate to select the +12.00 D (33510-G033) lens.
 b. Press the left- button ◀ or right+ button ▶ several times.
 c. Perform adjustment with the left- button ◀ or right+ button ▶ so that the whole chart is focused.
 d. Press the start button to confirm that the displayed numeric value is +12.12 D ±0.25 D.

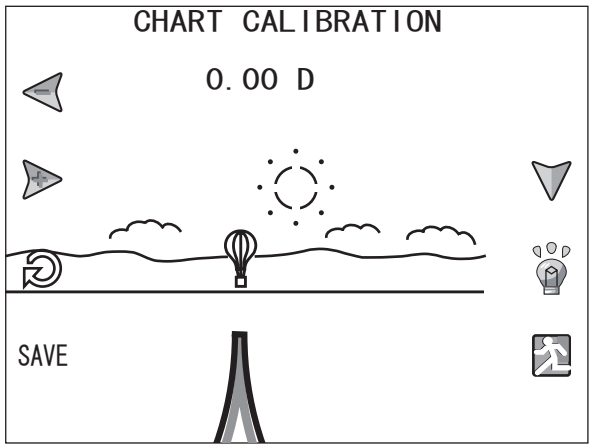


 5) Press the down button ▼.
 6) Check the -12.00 D position according to the steps below.
 a. Turn the turret plate to select the -12.00 D (33510-G018) lens.
 b. Press the left- button ◀ or right+ button ▶ several times.
 c. Perform adjustment with the left- button ◀ or right+ button ▶ so that the whole chart is focused.
 d. Press the start button to confirm that the displayed numeric value is -12 D ±0.25 D.

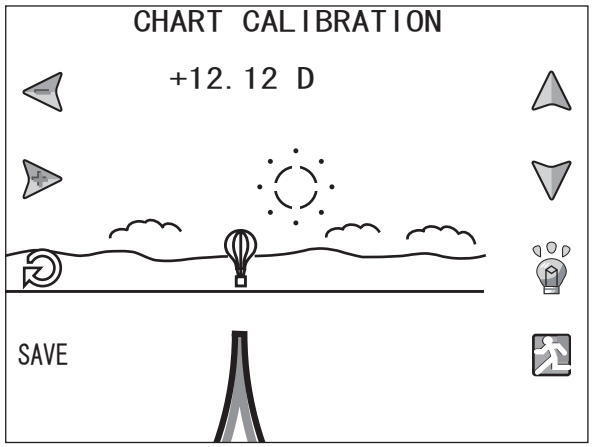


18. Press the next button N to display the BALOON CALIB screen.

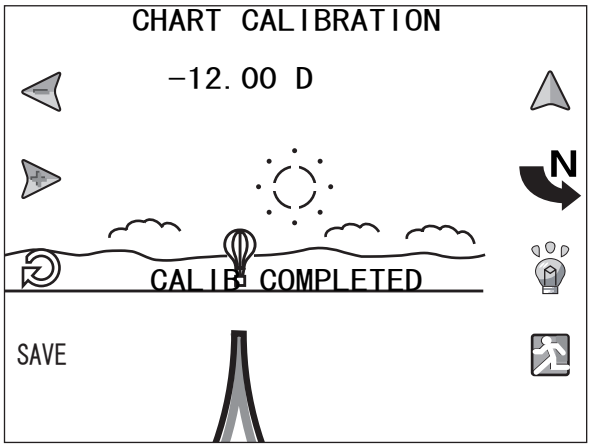
19. Perform BALOON CALIB as follows:
 1) Adjust the 0 D position according to the steps below.
 a. Turn the turret plate to select a position without any lens.
 b. Press the left- button ◁ or right+ button ▷ several times.
 c. Press the right+ button ▷ until the whole chart is focused for the first time.
 d. Press the SAVE button to save the 0 D position.



 2) Press the down button ▽ and adjust the +12.12D position according to the steps below.
 a. Turn the turret plate to select the +12.00 D (33510-G033) lens.
 b. Press the left- button ◁ or right+ button ▷ several times.
 c. Press the right+ button ▷ until the whole chart is focused for the first time.
 d. Press the SAVE button to save the +12.12 D position.

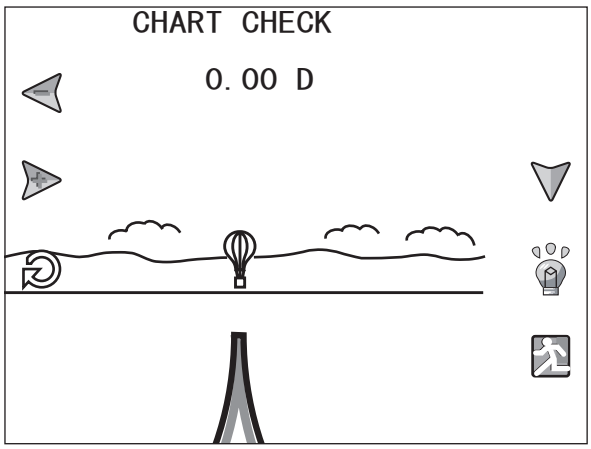


 3) Press the down button ▽ and adjust the -12.00 D position according to the steps below.
 a. Turn the turret plate to select the -12.00 D (33510-G018) lens.
 b. Press the left- button ◁ or right+ button ▷ several times.
 c. Press the left- button ◁ until the whole chart is focused for the first time.
 d. Press the SAVE button to save the -12.00 D position.
 * Pressing the SAVE button displays the next button N.

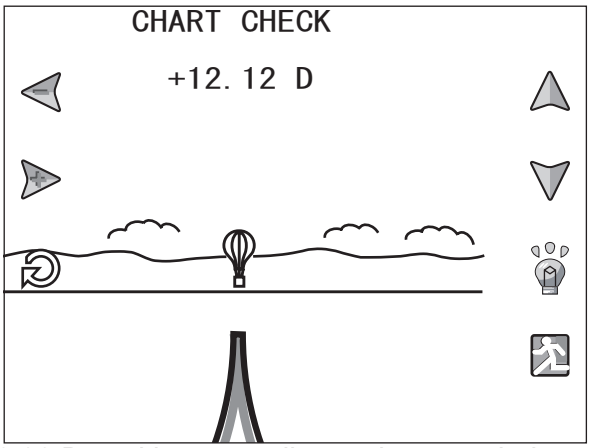


20. Press the next button N to display the BALOON CHECK screen.

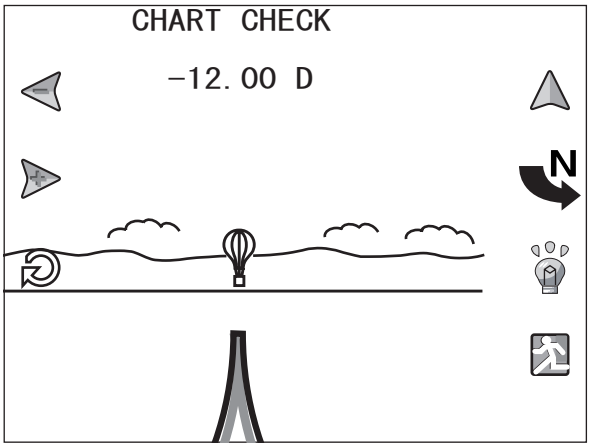
21. Perform BALOON CHECK as follows:
 1) Check the 0 D position according to the steps below.
 a. Turn the turret plate to select a position without any lens.
 b. Press the left- button ◁ or right+ button ▷ several times.
 c. Perform adjustment with the left- button ◁ or right+ button ▷ so that the whole chart is focused.
 d. Press the start button to confirm that the displayed numeric value is 0 D ±0.25 D.



 2) Press the down button ▽ and check the +12.12 D position according to the steps below.
 a. Turn the turret plate to select the +12.00 D (33510-G033) lens.
 b. Press the left- button ◁ or right+ button ▷ several times.
 c. Perform adjustment with the left- button ◁ or right+ button ▷ so that the whole chart is focused.
 d. Press the start button to confirm that the displayed numeric value is +12.12 D ±0.25 D.



 3) Press the down button ▽ and check the -12.00 D position according to the steps below.
 a. Turn the turret plate to select the -12.00 D (33510-G018) position.
 b. Press the left- button ◁ or right+ button ▷ several times.
 c. Perform adjustment with the left- button ◁ or right+ button ▷ so that the whole chart is focused.
 d. Press the start button to confirm that the displayed numeric value is -12 D ±0.25 D.

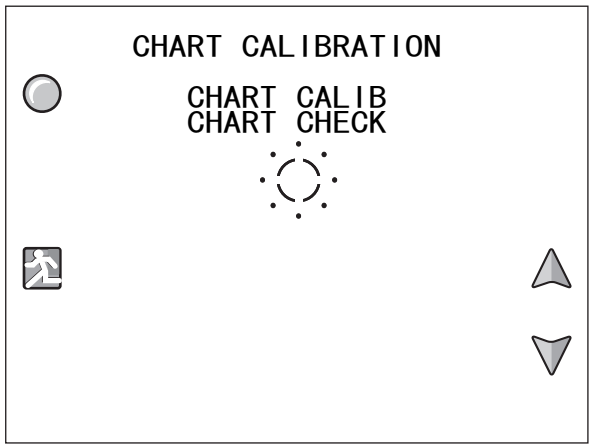


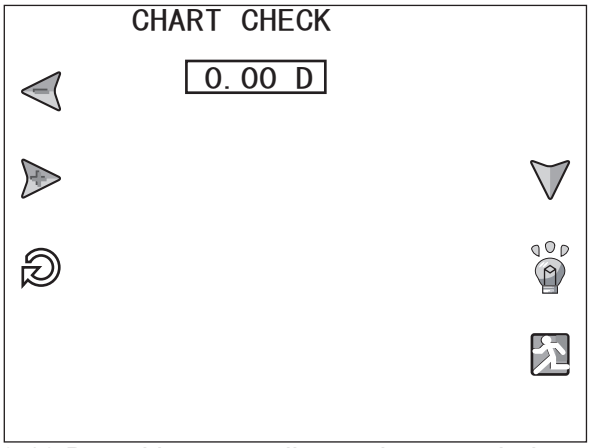
22. Press the next button N to display the CALIBRATION FINISH screen.
23. When “PLEASE SHUT OFF” is displayed, turn off the power switch.
24. Remove the chinrest attachment jig (32107-1100) and dioptric tester jig ASSY. (30670-6000).

7.6.6 Chart check

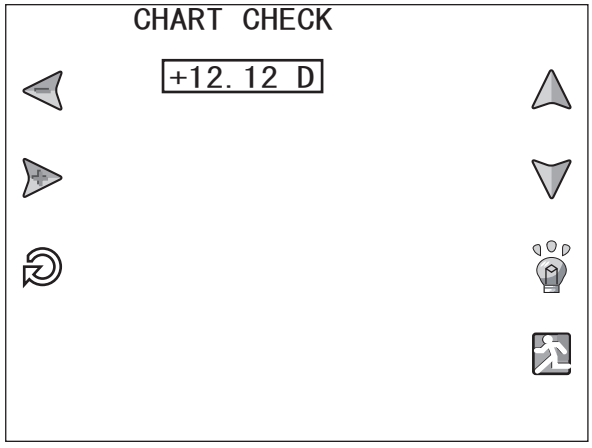
* If the adjustment jig is not available, return the device to the factory without performing adjustment.

1. Attach the chinrest attachment jig (32107-1100) and chart inspection jig (32145-2100 or 30670-2300) (see 7.6.5).
2. Display the CALIB MODE SELECT (for AR) screen (see 7.1.2).
3. Select CHART CHECK with the up ▲ or down ▼ button, then press the set button ●.
4. Turn the turret plate of the chart inspection jig to select the 0 D model eye.
5. Align the 0 D model eye so that the focusing indicator displays the optimum condition.
6. Fix the measuring unit with the fixing lever.
 * Fix the unit while the focusing indicator is in the optimum condition.
7. Check the chart positions according to the steps below.
 1) 0 D position
 a. Turn the turret plate to select a position without any lens.
 b. Press the left- button ◀ or right+ button ▶▶ several times.
 c. Press the right+ button ▶ or left- button ◀ until the whole chart is focused for the first time.
 d. Press the start button to confirm that the displayed numeric value is 0 D ±0.25 D.

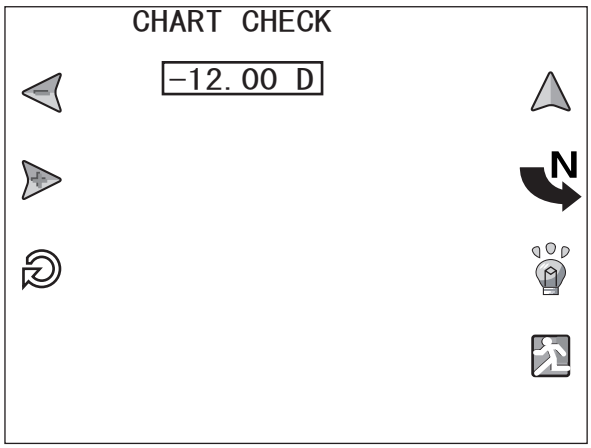




 2) Press the down button ▼ and adjust the +12.12 D position according to the steps below.
 a. Turn the turret plate to select the +12.00 D (33510-G033) lens.
 b. Press the left- button ◀ or right+ button ▶▶ several times.
 c. Press the right+ button ▶ until the whole chart is focused for the first time.
 d. Press the start button to confirm that the displayed numeric value is -12 D ±0.25 D.



3) Press the down button and adjust the -12.00 D position.
 a. Turn the turret plate to select the -12.00 D (33510-G018) lens.
 b. Press the left- button or right+ button several times.
 c. Perform adjustment with the left- button or right+ button so that the whole chart is focused.
 d. Press the start button to confirm that the displayed numeric value is -12 D ±0.25 D.



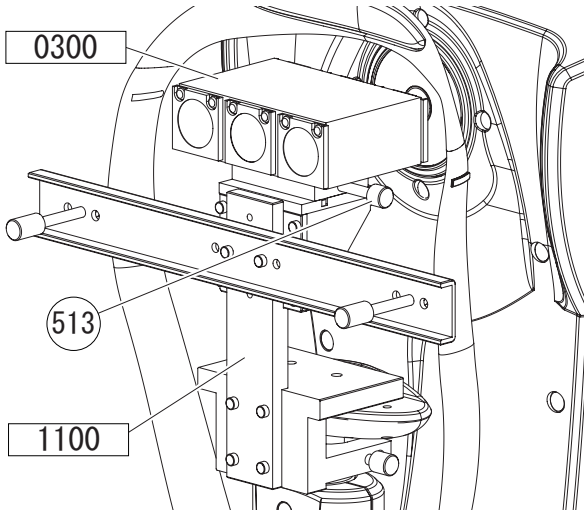
8. When the value is not within the specified range, perform the chart calibration (see 7.6.5).
9. Press the exit button twice to turn off the power switch.
10. Remove the chinrest attachment jig (32107-1100) and chart inspection jig (32145-2100 or 30670-2300).

7.7 KM Calibration

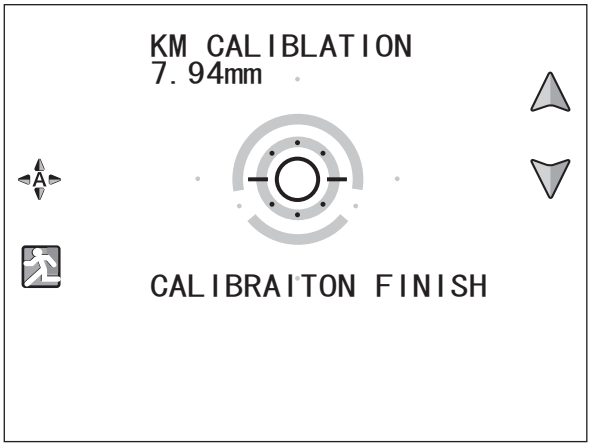
* Perform the KM calibration for the ARK-560A , ARK-530A, and ARK-510A only.

7.7.1 KM CALIB

1. Attach the following jigs.
 1) Attach the chinrest attachment jig (32107-1100) (see 7.5).
 2) Attach the KM calibration jig (30670-0300) to the chinrest attachment jig (32107-1100).
 * Fix the jig with the knob (32177-M513).



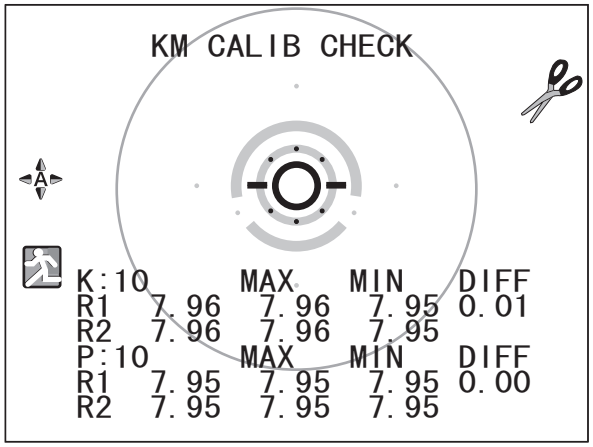
2. Display the CALIB MODE SELECT (for KM) (see 7.1.6).
 * When the software is earlier than Ver. 2.03, press the reset button.
 * When the software is Ver. 2.03 or later, the reset button is not displayed.
3. Perform KM CALIBRATION as follows:
 1) Align the relevent steel ball of the KM calibration jig(30670-0300)in the order of the following numeric values so that the focusing indicator displays the optimum condition.
 a. 7.94 mm
 b. 5.95 mm
 c. 9.13 mm
 2) Press the start button to perform KM CALIBRATION.
 * Perform calibration for all the three steel balls.



4. Press the SAVE button to save the setting.
5. Press the exit button once.
6. Perform KM CALIB CHECK (see 7.7.2).
7. Perform KM AXIS CHECK (see 7.7.4).

7.7.2 KM CALIB CHECK

1. Attach the chinrest attachment jig (32107-1100) and KM calibration jig (30670-0300) (see 7.7.1).
2. Display the CALIB MODE SELECT (for KM) screen (see 7.1.6).
3. Select KM CALIB CHECK with the up ▲ or down ▼ button and press the set button ◉.
4. Measure each steel ball of the KM calibration jig (30670-0300) and confirm that each measured value is within the specifications.
 * R1 and R2 in the upper rows of the measurement results are the center KM measurement values, and R1 and R2 in the lower rows are the peripheral KM measurement values.
 1) K:10: the number of the KM measurements
 2) MAX : the maximum value among the ten measurements
 3) MIN : the minimum value among the ten measurements
 4) DIFF: the difference between the maximum and minimum values
 5) R1 : the measured value of the major axis
 6) R2 : the measured value of the minor axis
 7) P:10: the number of the peripheral KM measurements



5. When the measurement results are out of the specifications, perform KM ADJUST (see 7.7.3).
 1) The specifications of the KM measurements

Corneal curvature radius	Tolerance (mm)	Difference between R1 and R2 (mm)
R 5.00	±0.02	0.04
R 5.95	±0.02	0.04
R 7.94	±0.02	0.04
R 9.13	±0.02	0.04
R 10.00	±0.03	0.04
R 13.00	±0.05	0.04

 2) The specifications of the peripheral (ϕ 6) KM measurements

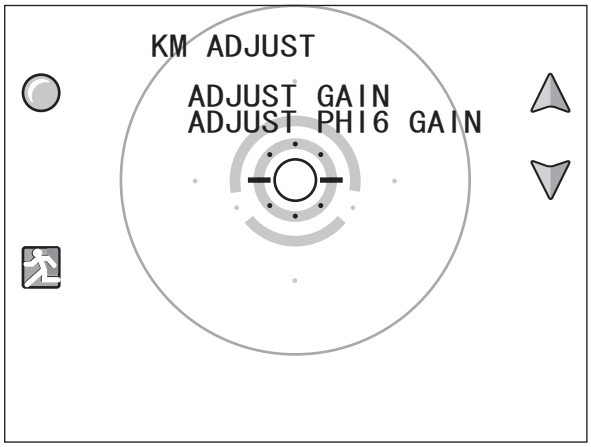
Corneal curvature radius	Tolerance (mm)	Difference between R1 and R2 (mm)
R 5.00	±0.05	0.05
R 5.95	±0.05	0.05
R 7.94	±0.05	0.05
R 9.13	±0.05	0.05
R 10.00	±0.05	0.05
R 13.00	±0.05	0.05

7.7.3 KM ADJUST

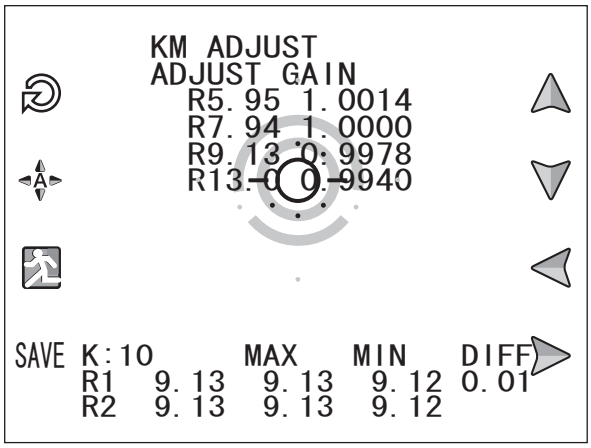
1. When the KM measurement values are out of the specifications, perform ADJUST GAIN (see 7.7.3.1).
2. When the peripheral KM measurement values are out of the specifications, perform ADJUST PHI6 GAIN (see 7.7.3.2).

7.7.3.1 ADJUST GAIN

1. Attach the chinrest attachment jig (32107-1100) and KM calibration jig (30670-0300) (see 7.7.1).
2. Display the CALIB MODE SELECT (for KM) screen (see 7.1.6).
3. Select KM ADJUST with the up △ or down ▽ button and press the set button ○.
4. Select ADJUST GAIN with the up △ or down ▽ button and press the set button ○.



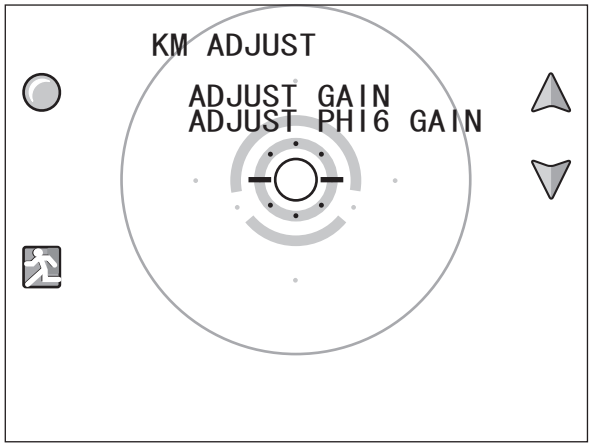
5. Perform corrections as follows:
 * Perform corrections by taking the median value of specifications as the standard.
 * Change the numeric value by 0.0010 (as a guide) for each correction of 0.01 mm.
 1) Select the steel ball to be changed with the up △ or down ▽ button.
 2) Change the numeric value with the right ▷ or left ◁ button.
 3) Press the start button to confirm the measured values.
 4) Press the SAVE button to save the setting.
 5) Perform adjustment as follows:
 a. When the measurement values for each steel ball of the KM calibration jig (30670-0300) differ by the same amount, change all correction factors by the same numeric value.
 b. When the measurement values for only a part of the steel balls of the KM calibration jig (30670-0300) differ by the same amount, change the correction factors close to the radiuses of such steel balls.



6. Press the exit button ⏏ three times to restart the device.

7.7.3.2 ADJUST PHI6 GAIN

1. Attach the chinrest attachment jig (32107-1100) and KM calibration jig (30670-0300) (see 7.7.1).
2. Display the CALIB MODE SELECT (for KM) screen (see 7.1.6).
3. Select KM ADJUST with the up △ or down ▽ button and press the set button ◯.
4. Select ADJUST PHI6 GAIN with the up △ or down ▽ button and press the set button ◯.

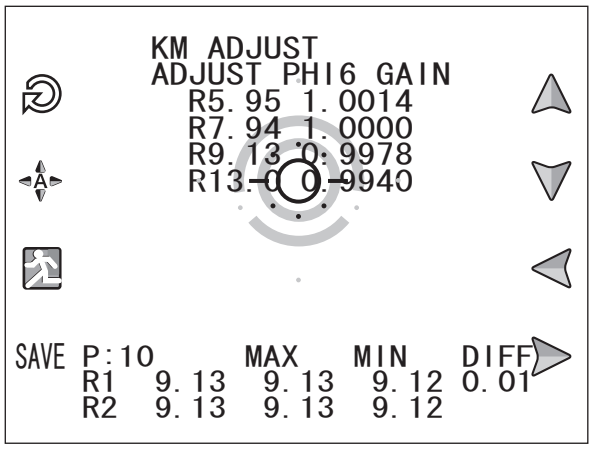


5.Perform corrections as follows:

* Perform corrections by taking the median value of specifications as the standard.

* Change the numeric value by 0.0010 for each correction of 0.01 mm.

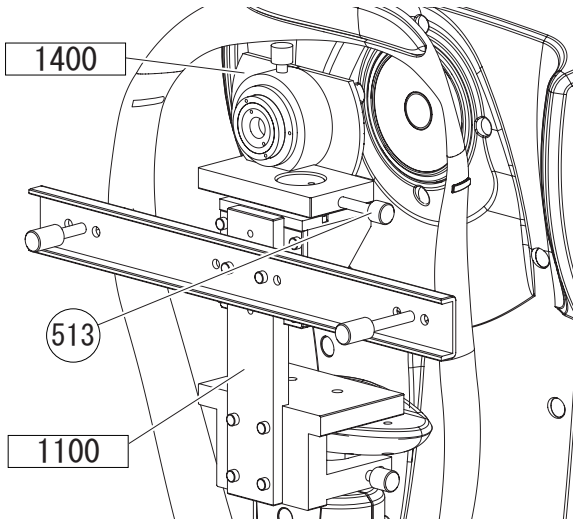
1) Select the steel ball to be changed with the up △ or down ▽ button.
2) Change the numeric value with the right ▷ or left ◁ button.
3) Press the start button and perform the measurement.
4) Confirm that the measured values are within the specifications.
5) Press the SAVE button to save the setting.
6) Perform adjustment as follows:
 a. When the measurement values for each steel ball of the KM calibration jig (30670-0300) differ by the same amount, change all correction factors by the same numeric value.
 b. When the measurement values for only a part of the steel balls of the KM calibration jig (30670-0300) differ by the same amount, change the correction factors close to the radiuses of such steel balls.



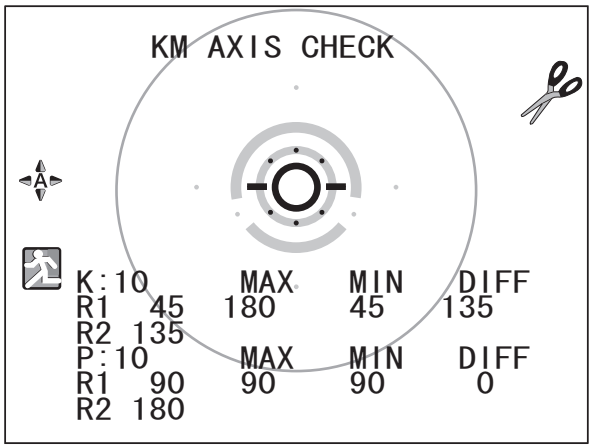
6. Press the exit button ⏻ twice to turn off the power.

7.7.4 KM AXIS CHECK

1. Attach the following jigs.
 1) Attach the chinrest attachment jig (32107-1100) (see 7.5).
 2) Attach the aspheric model eye jig (32177-1400).
 * Fix it with the knob (32177-M513).



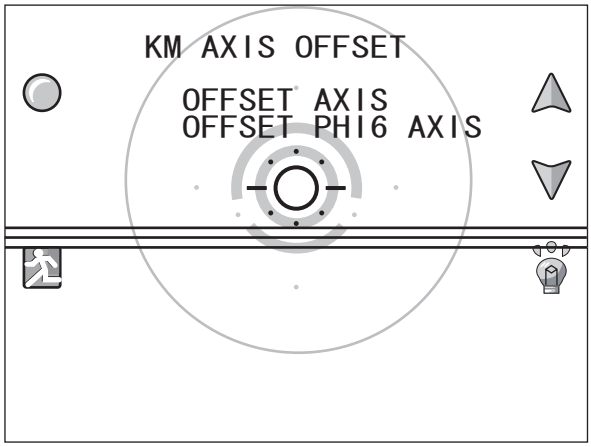
2. Display the CALIB MODE SELECT (for KM) screen (see 7.1.6).
3. Select KM AXIS CHECK with the up △ or down ▽ button and press the set button ○.
4. Measure each angle (0º, 45º, 90º, 135º) of the aspheric model eye jig (32177-1400) and confirm that the measured values are within the specifications.
 * R1 and R2 in the upper rows of the measurement results are the center KM measurement values, and R1 and R2 in the lower rows are the peripheral KM measurement values.
 1) K:10: the number of the KM measurements
 2) MAX : the maximum value among the ten measurements
 3) MIN : the minimum value among the ten measurements
 4) DIFF: the difference between the maximum and minimum values
 5) R1 : the measured value of the major axis
 6) R2 : the measured value of the minor axis
 7) P:10: the number of the peripheral KM measurements



5. Confirm that the measured values for the corneal cylinder axis angles (0º, 45º, 90º, 135º) of the aspheric model eye jig (32177-1400) are each angle ±2º.
6. When the measurement results are out of the specifications, perform KM AXIS OFFSET (see 7.7.5).

7.7.5 KM AXIS OFFSET

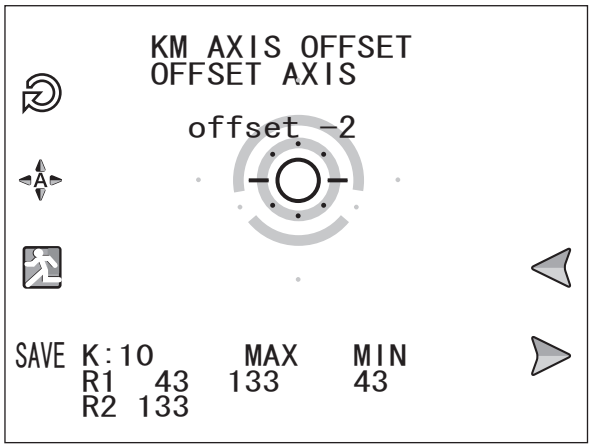
1. Attach the chinrest attachment jig (32107-1100) and aspheric model eye jig (32177-1400) (see 7.7.4).
2. Display the CALIB MODE SELECT (for KM) screen (see 7.1.6).
3. Select KM AXIS OFFSET with the up △ or down ▽ button and press the set button ○.
4. Align the marking-off line with the three horizontal lines of the aspheric model eye jig.



5. When the center KM measurement values are out of the specifications, perform OFFSET AXIS (see 7.7.5.1).
6. When the peripheral KM measurement values are out of the specifications, perform OFFSET PHI6 AXIS (see 7.7.5.2).

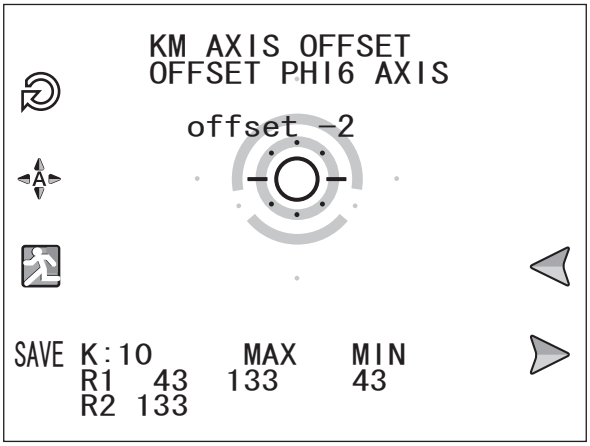
7.7.5.1 OFFSET AXIS

1. Perform KM AXIS OFFSET (see 7.7.5).
2. Select OFFSET AXIS with the up △ or down ▽ button and press the set button ○.
3. Perform corrections as follows:
 1) Change the numeric value with the right ▷ or left ◁ button.
 * Corrections of the measured values can be performed within the range of ±5º.
 2) Press the start button to perform the measurement.
 3) Confirm that the measured values for the corneal cylinder axis angles (0º, 45º, 90º, 135º) of the aspheric model eye jig are each angle ±2º.
 4) Press the SAVE button to save the setting.
4. Press the exit button ⏏ twice to turn off the power switch.



7.7.5.2 OFFSET PHI6 AXIS

1. Perform KM AXIS OFFSET (see 7.7.5).
2. Select OFFSET PHI6 AXIS with the up ▲ or down ▼ button and press the set button ●.
3. Perform corrections as follows:
 1) Change the numeric value with the right ▶ or left ◀ button.
 * Corrections of the measured values can be performed within the range of ±5º.
 2) Press the start button to perform the measurement.
 3) Confirm that the measured values for the corneal cylinder axis angles (0º, 45º, 90º, 135º) of the aspheric model eye jig are each angle ±4º.
 4) Press the SAVE button to save the setting.

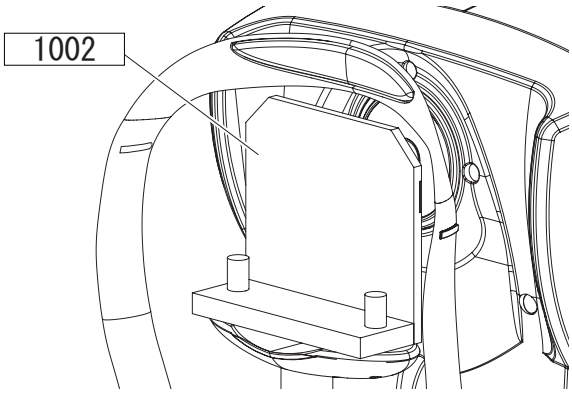


4. Press the exit button twice to turn off the power.

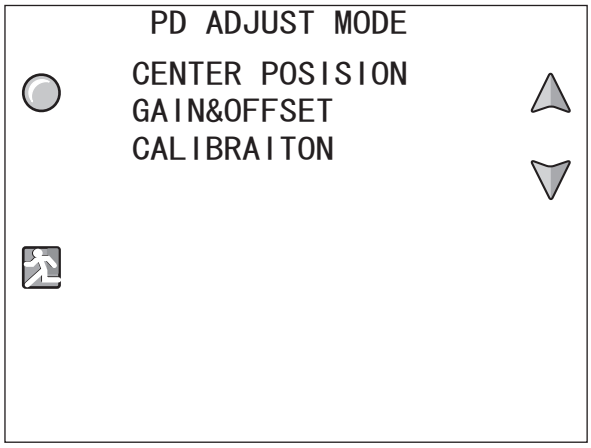
7.8 PD Calibration

7.8.1 CENTER POSITION

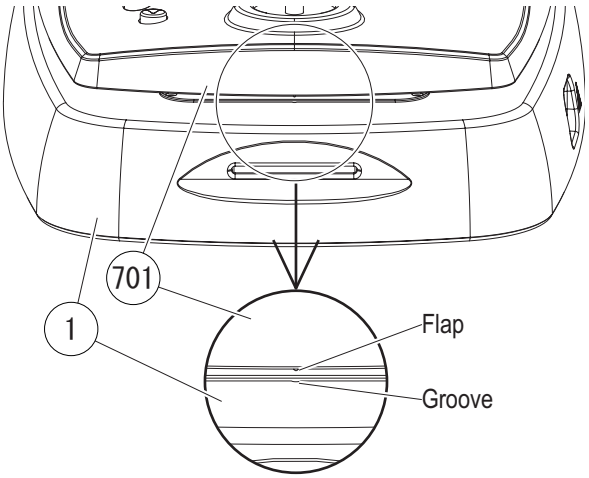
1. Attach the PD checking jig (32545-1002) to the chinrest.
 * A scale can be used as substitute for the PD checking jig (32545-1002).



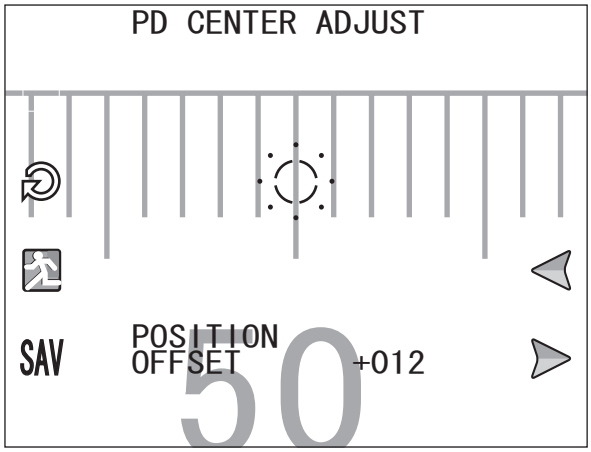
2. Enter the MENU mode and select 15. PD ADJUST MODE (see 7.1.1).
3. Select CENTER POSITION with the up ▲ or down ▼ button and press the set button ●.



4. Align the flap of the rear body cover (30601-M701) with the groove of the base (30601-M001).

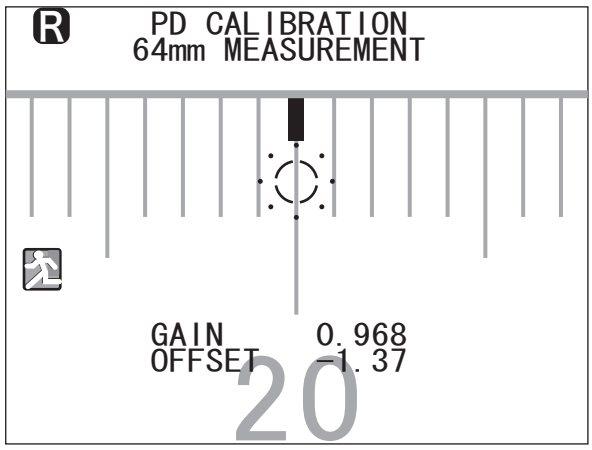


5. Focus the PD checking jig while the flap and groove are aligned.
6. Confirm that the discrepancy from the center 50 mm position is within ±5 mm.
7. Press the start button to save the PD CENTER position.
8. Press the SAVE button to save the setting.
9. Press the exit button.
10. Perform the PD calibration (see 7.8.2).

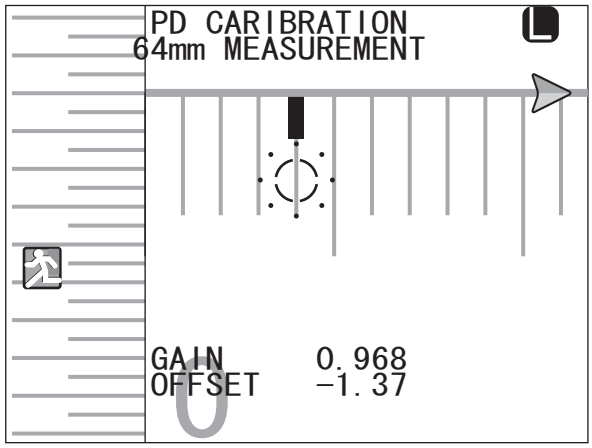


7.8.2 PD CALIBRATION

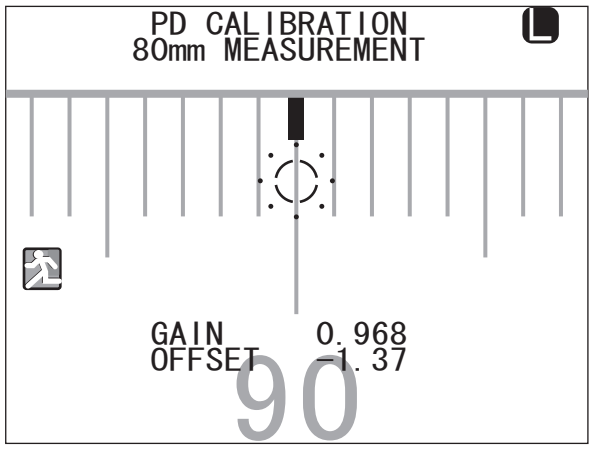
1. Attach the PD checking jig (32545-1002) to the chinrest (see 7.8.1).
 * A scale can be used as substitute for the PD checking jig (32545-1002).
2. Enter the MENU mode and select 15. PD ADJUST MODE (see 7.1.1).
3. Select PD CALIBRATION with the up △ or down ▽ button and press the set button ○.
4. Align the focusing indicator with the 20 mm position of the jig and press the start button.



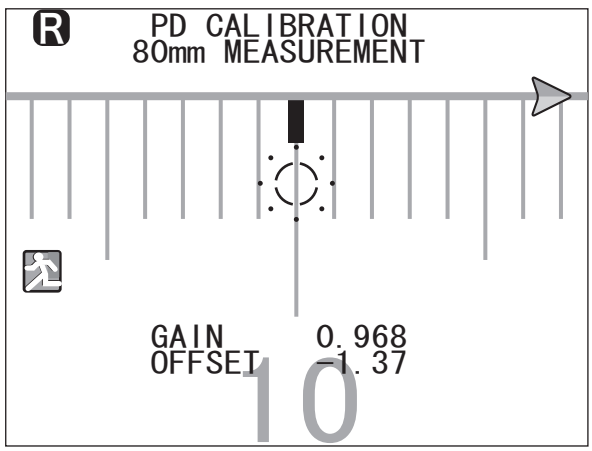
5. Align the focusing indicator with the 84 mm position of the jig and press the start button.
6. Press the right button ▷.



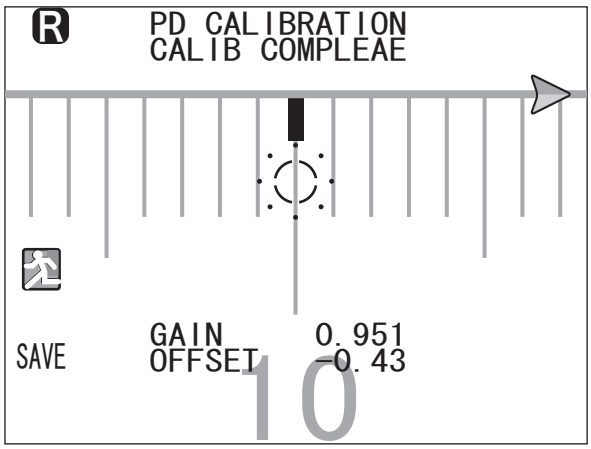
7. Align the focusing indicator with the 90 mm position of the jig and press the start button.



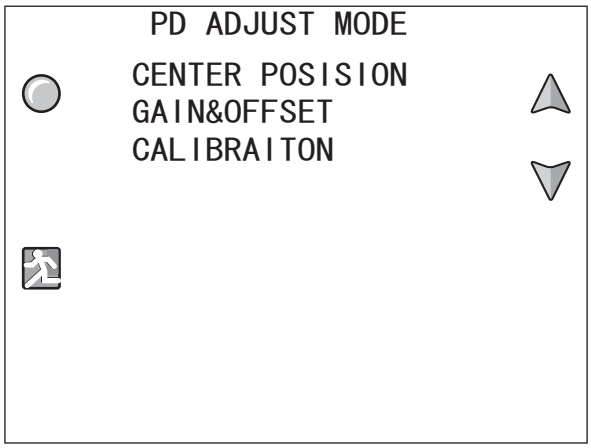
8. Align the focusing indicator with the 10 mm position of the jig and press the start button.
9. Press the right button ▷.



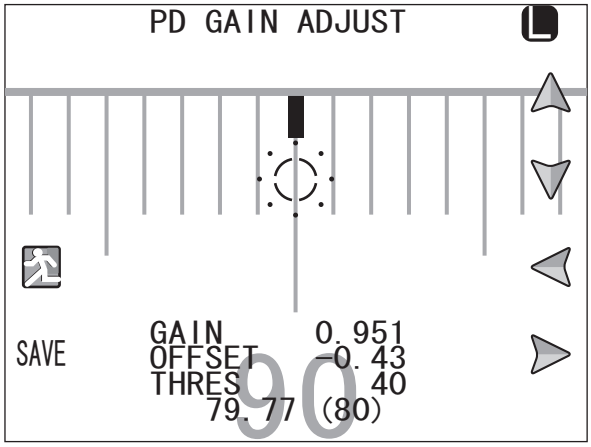
10.”CALIB COMPLETE” is displayed. Press the SAVE button to save the setting.
11. Press the right button ▷ and then the exit button .



12.Select GAIN & OFFSET with the up △ or down ▽ button and press the set button .



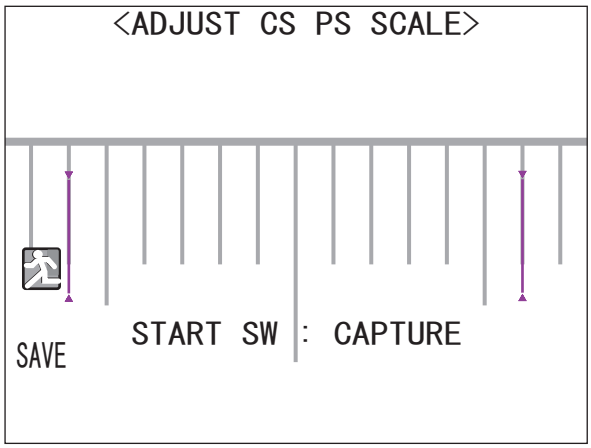
13. Measure the PD values at the 64 mm and 80 mm positions, and confirm the results meet the following specifications.
 1) PD 64 mm: less than 64 ±1.0 mm
 2) PD 80 mm: within 80 ±1.0 mm
14. When the measured values are out of the specifications, perform the PD calibration once again (see 7.8).



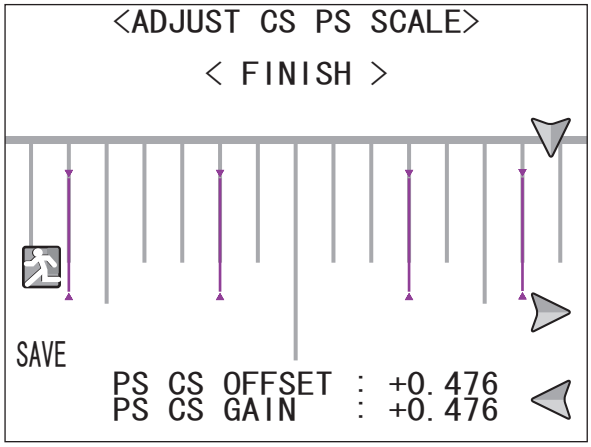
7.9 CS /PS Calibration

* The CS/PS calibration can be performed in the ARK-560A, ARK-530A, and ARK-510A only.

1. Attach the PD checking jig (32545-1002) to the chinrest (see 7.8.1).
 * A scale can be used as substitute for the PD checking jig (32545-1002).
2. Enter the MENU mode and select 16. CS PS ADJUST (see7.1.1).
3. Press the start button.
4. The screen is captured and the CS calibration screen appears, and the right-side cursor turns pink.



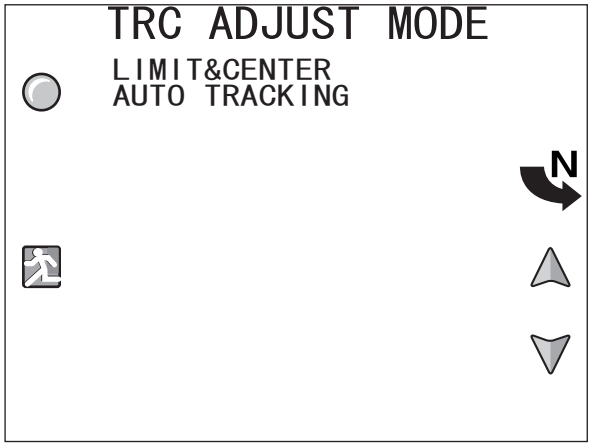
5. Perform the CS calibration as follows:
 1) Align the right-side cursor with the scale with the right ▷ or left ◁ button.
 2) Select the left-side cursor with the down button ▽.
 3) Position the left-side cursor at a distance of 12 mm from the right-side cursor with the right ▷ or left ◁ button.
6. Press the start button to display the PS calibration screen.
7. Perform the PS calibration as follows:
 1) Align the right-side cursor with the scale with the right ▷ or left ◁ button.
 2) Select the left-side cursor with the down button ▽.
 3) Position the left-side cursor at a distance of 5 mm from the right-side cursor with the right ▷ or left ◁ button.
8. Press the SAVE button to save the setting.
9. Measure the CS value at 12 mm and PS value at 5 mm, and confirm that the results meet the specifications below.
 1) CS: within 12 mm ±0.2 mm
 2) PS: within 5 mm ±0.2 mm
10. When the CS or PS measurement values are out of the specifications, perform the calibrations for the items out of the specifications once again.



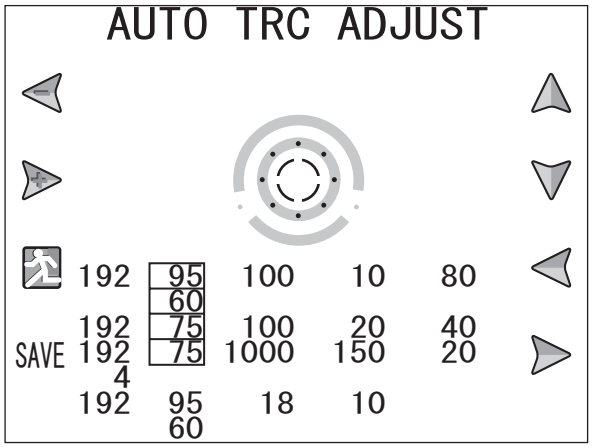
7.10 AUTO TRC ADJUST

* Perform adjustment only when the R/L motor (30602-EA26), F/B motor(30602-EA27), or U/D motor (30601-EA28) is replaced. In other cases, adjustment is not necessary as the factory setting is optimized.

1. Attach the simple calibration model eye (32107-6200).
2. Enter the MENU mode and select 11. TRC ADJUST MODE (see 7.1.1).
3. Select AUTO TRACKING and press the set button ◯.
4. Confirm the movement of auto tracking.
 * Auto tracking should move smoothly in left/right, up/down, and back/forth directions.
 * Overshoot should not occur more than four times.



5. When the conditions described in Step 4 are not met, change the four numeric values in the second column from the left as shown to the right according to the steps below.
 1) The first row: upward
 2) The second row: downward
 3) The third row: left/right direction
 4) The fourth row: back/forth direction
 a. Select the numeric value with the up △ or down ▽ button.
 b. Change the numeric value with the right ▷, right + ▷, left ◁, or left - ◁ button.



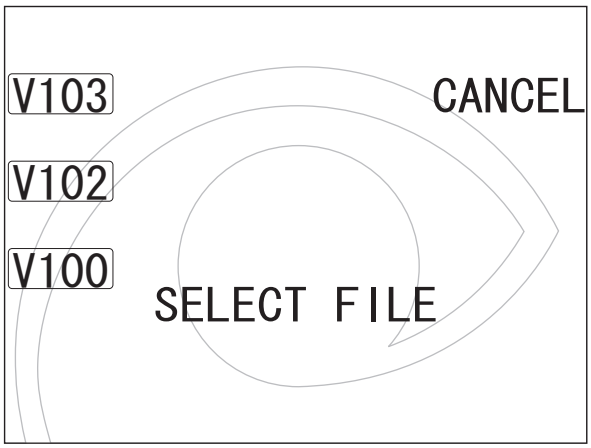
* The right ▷ and left ◁ buttons increase or decrease the numeric value by 1 and the right + ▷ and left - ◁ buttons by 5.

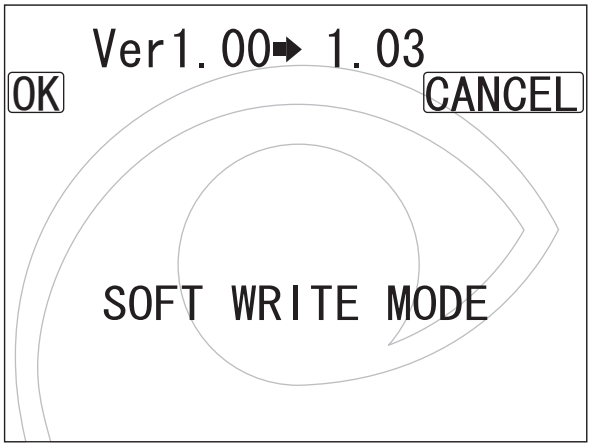
* As each numeric value increases, the auto-tracking speed becomes faster, and as the values decrease, the speed becomes slower.

* Increasing each numeric value too much destabilizes the movement of auto tracking.

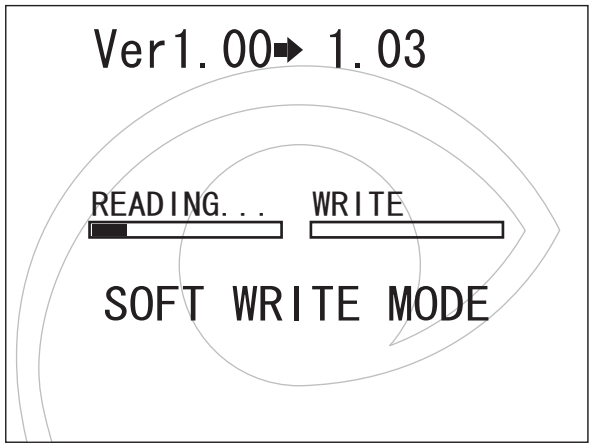
7.11 Upgrading Software

1. Turn off the power.
2. Connect the USB flash drive (30601-E030) to the USB A connector of the main body.
 *USB flash drive: If 30601-E030 is not available, a USB flash drive made by SanDisk is recommended.
 * It is possible that the device does not recognize a USB flash drive even though it is made by SanDisk.
3. Turn on the power.
4. The screen for selecting file is displayed when there are two or more upgrading files in the USB flash drive (30601-E030).
 * The screen for selecting file is displayed only when two or more upgrading files are saved.
 * When four or more upgrading files are saved, no files from the fourth are recognized. Be sure to save three or less files.
 * When saving upgrading files in the USB flash drive, be sure to save them in the root. (Do not create a folder to save the files in.)
5. Upgrading software are as follows:
 1) For AR: AR17_SOFTWRITE_V1**. MOT
 2) For ARK: AR17_SOFTWRITE_V2**. MOT
6. Press the upgrading file.
7. The screen for checking upgrade is displayed.
8. Press OK.

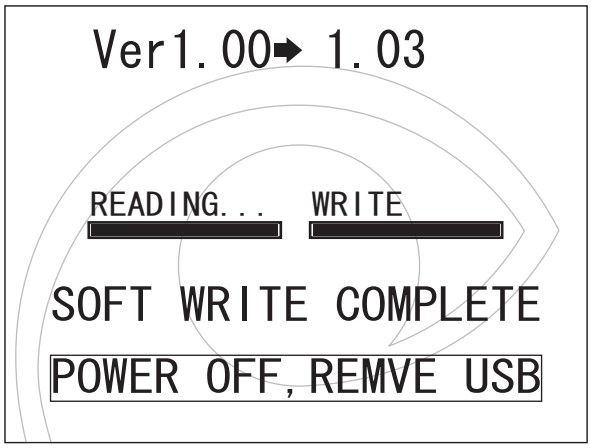




9. The screen shown to the right appears and upgrading starts.

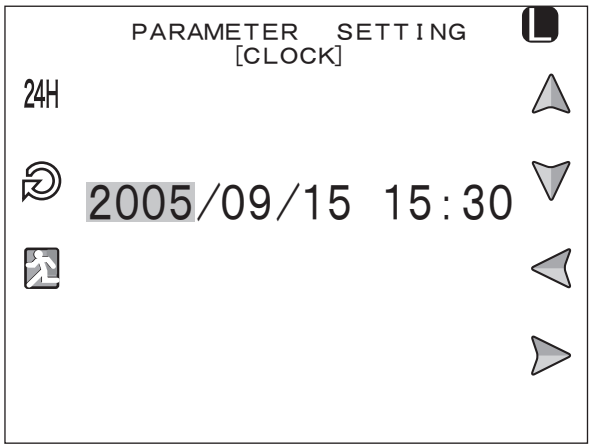


10. After upgrading is completed, the screen shown to the right appears. Turn off the power.
11. Disconnect the USB flash drive from the device.
12. Turn on the power and confirm that the device starts properly.
13. When upgrading was not successful, start from Step 1 again .



7.12 Setting Time and Date

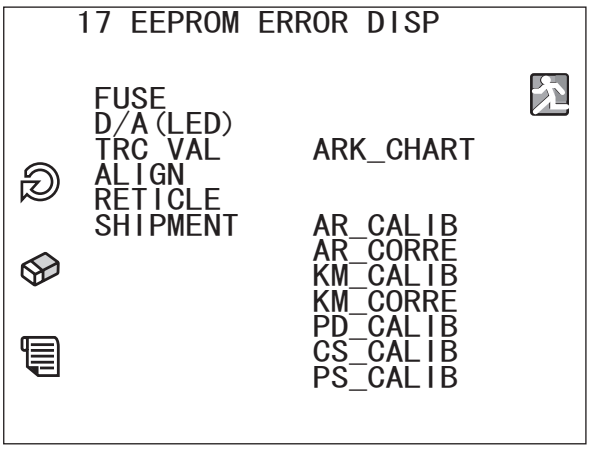
1. Display the PARAMETER SETTING screen (see 7.1.5).
2. Select CLOCK SET with the up ▲ or down ▼ button and press the set button ○.
3. Move the cursor to the item to be changed with the up ▲ or down ▼ button.
4. Change the numeric value with the right ▶ or left ◀ button.
 * Pressing the reset button ↻ changes the format of the date in the order of “YY/MM/DD” to “MM/DD/YY” to “DD/MM/YY”.
 * Pressing 24H or 12H selects the 24-hour or 12-hour indication.
5. Press the exit button 🚪 to return to the PARAMETER SETTING screen.
6. Press the exit button 🚪 to return to the measurement screen.



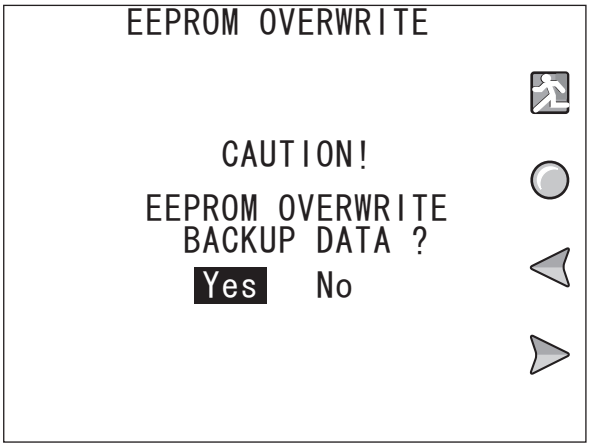
7.13 Rewriting EEPROM Data

* Rewrite the EEPROM data only when the driver board (30601-BA03) is replaced.
* Improper operation may delete the adjustment data saved in the driver board (30601-BA03).

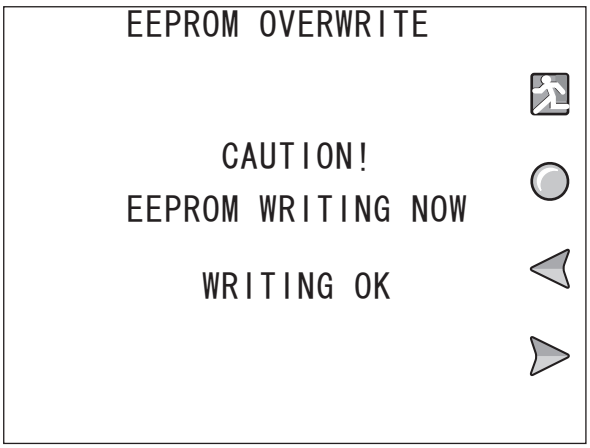
1. Enter the MENU mode and select 17. EEPROM ERROR DISP (see 7.1.1).
 * When ERR001 occurs, the item that has the error is highlighted in red.
2. Press the reset button.



3. Select Yes with the right or left button and press the set button.
 * The backup data is rewritten from the main board (30601-BA01) to the driver board (30601-BA03).

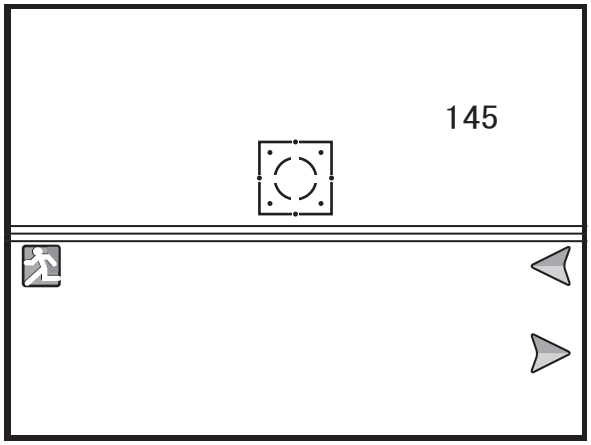


4. When the screen shown to the right is displayed, press the exit button twice to restart the device.



7.14 CURSOR BOARD

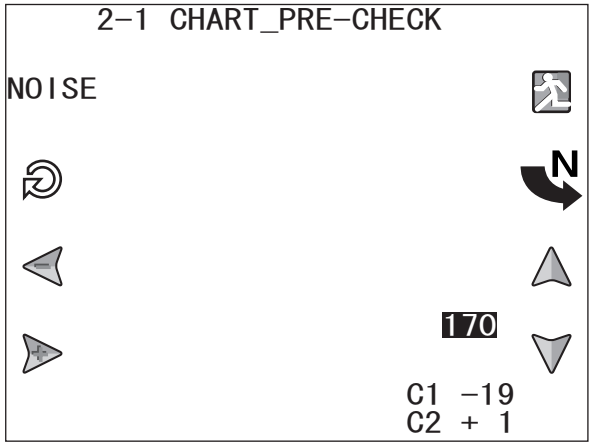
1. Display the CALIB MODE SELECT (for AR) screen and select CURSOR (see 7.1.2).
2. Confirm that pink lines are displayed on all four edges of the color LCD (30601-E005).
3. When the pink lines cannot be seen, adjust the position of the LCD front cover (30601-M715) (see 5.10).



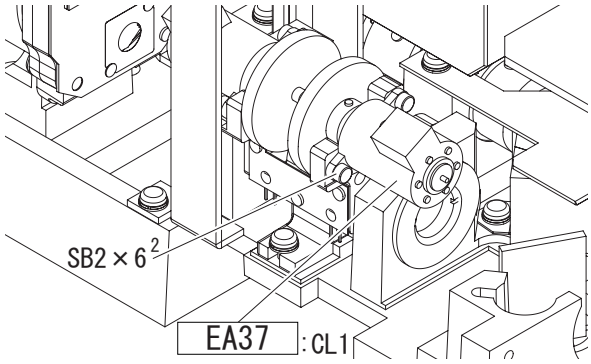
7.15 Subjective Cylinder ASSY.

* The subjective cylinder ASSY. must be adjusted for the eyes in a state of emmetropia. For those other than emmetrope, correction is required.

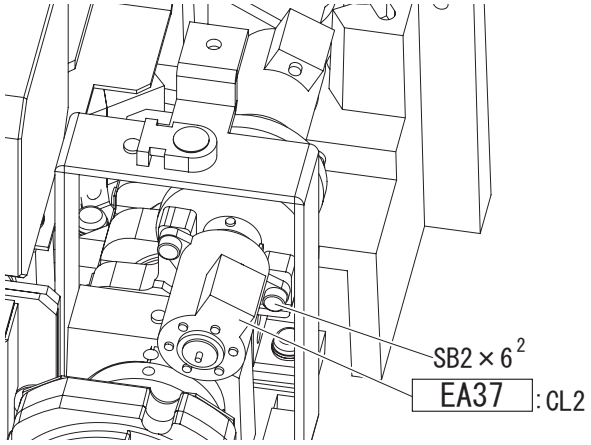
1. Enter the MENU mode to select 2. CHART POSITION (see 7.1.1).
2. Press the next button N to display the 2-1 CHART PRE-CHECK screen.
3. Press the panel button to display “NOISE”.



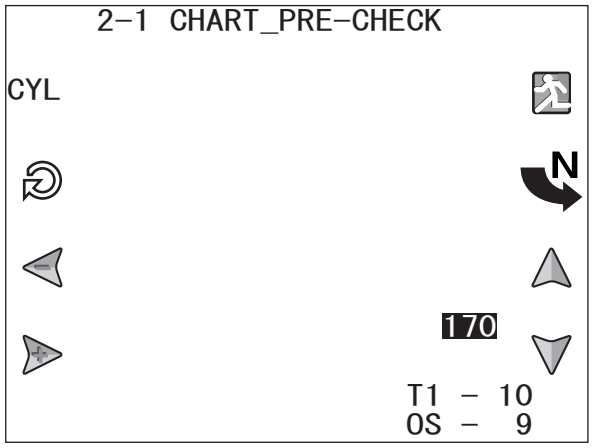
4. When the subjective cylinder ASSY. is operated, check the operation noise of the motor following the steps below.
 1) CL1 side of the subjective cylinder ASSY.
 a. Press the left- button ◁ to rotate the cylindr to the CL1 side.
 b. If the operation noise is loud, loosen SB2 × 6 (n = 2) to adjust the position of the CL motor (30703-EA37) to the CL1 side.



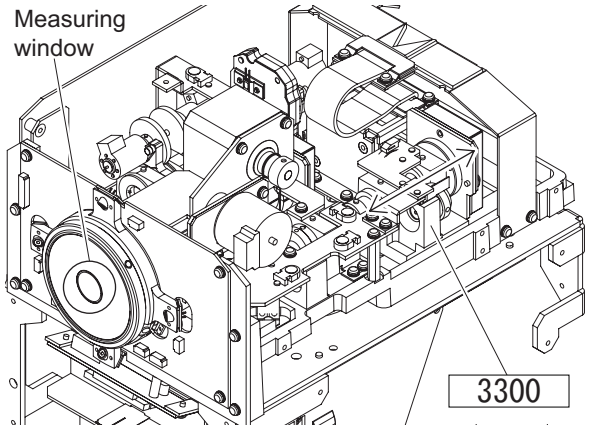
 2) CL2 side of the subjective cylinder ASSY.
 a. Press the right+ button ▷ to rotate the cylinder to the CL2 side.
 b. If the operation noise is loud, loosen SB2 × 6 (n = 2) to adjust the position of the CL motor (30703-EA37) to the CL2 side.



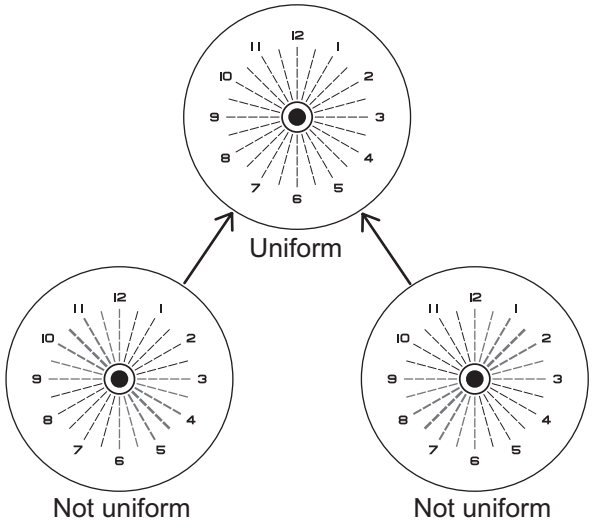
5. Press the panel button to display “CYL”.
 * The chart changes to the clock dial chart.



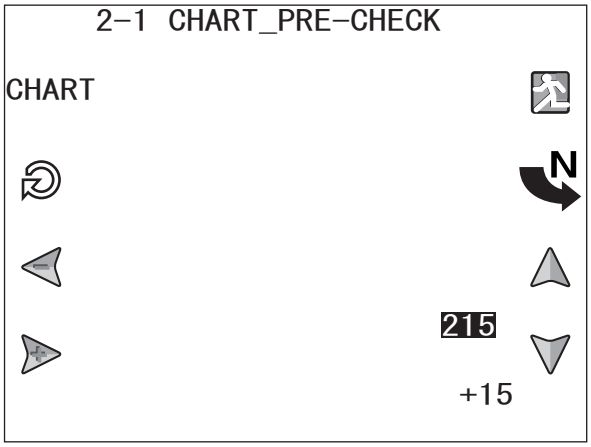
6. Move the subjective focus base ASSY. (30703-3300) forward and backward so that the chart can be seen through the measuring window.



7. Adjust the subjective cylinder ASSY. (30703-3700) with the right+ button ▷ or left- button ◁ so that the clock dial chart can be seen in uniform clarity.



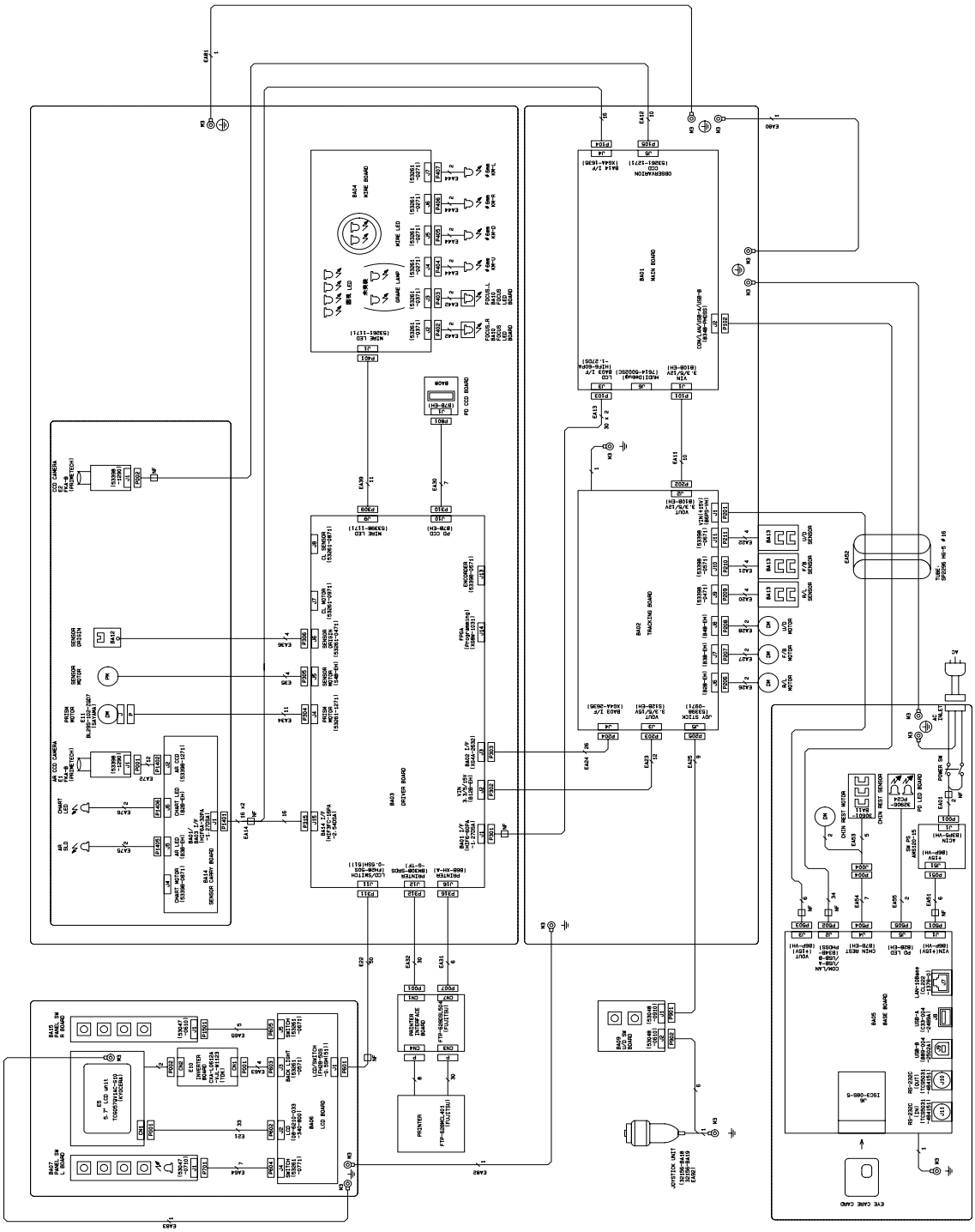
8. Press the panel button to display “CHART”.
9. Confirm that all charts which are displayed by pressing the reset button ↻ have no dust or scratches when seen through the measuring window.
10. Perform the chart calibration (see 7.6.5).



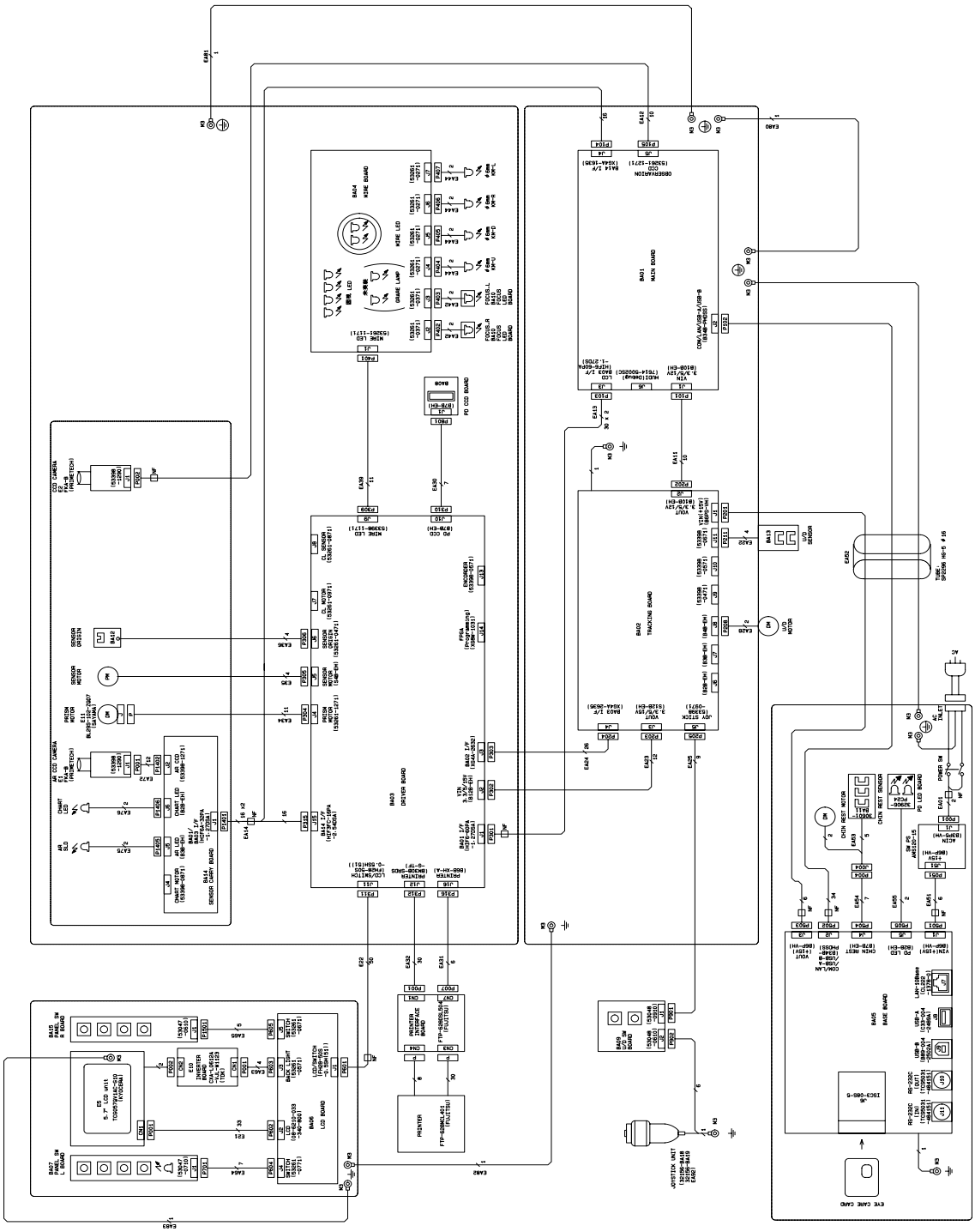
§8 SUPPLEMENT

8.1 Wiring Diagram

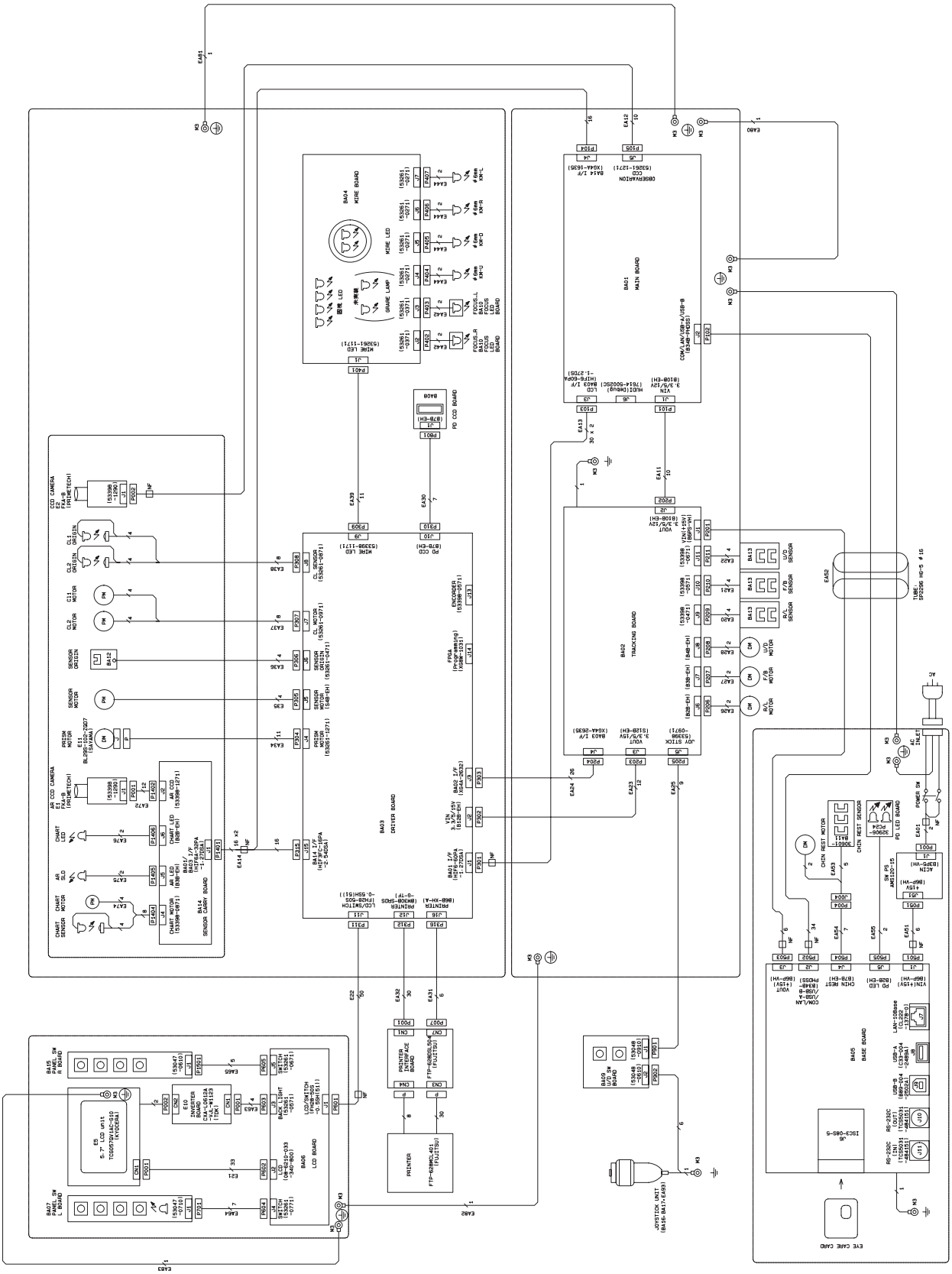
30602-E000 (AR-330A, ARK-530A)



30601-E000 (AR-310A, ARK-510A)

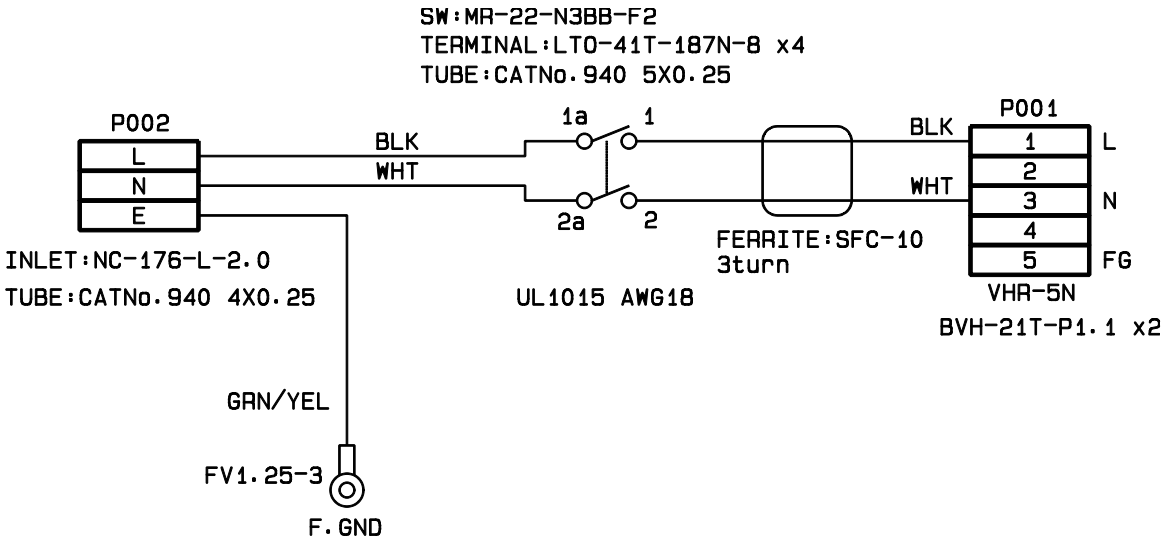


30603-E000 (AR-360A), 30703-E000 (ARK-560A)

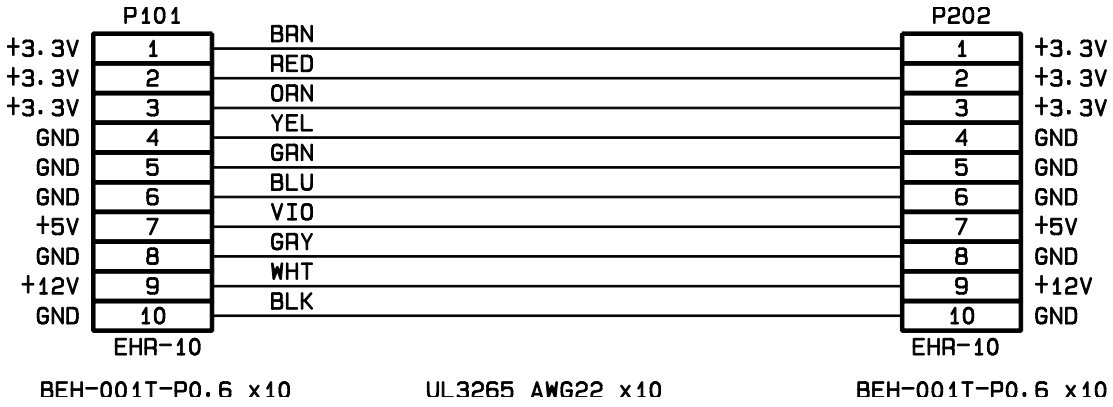


8.2 Connector Cable

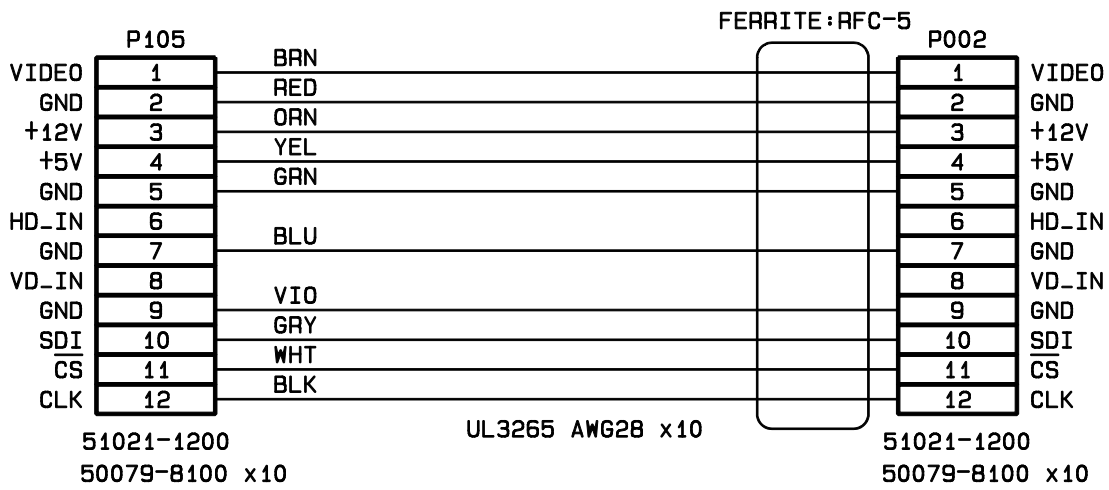
30601-EA01



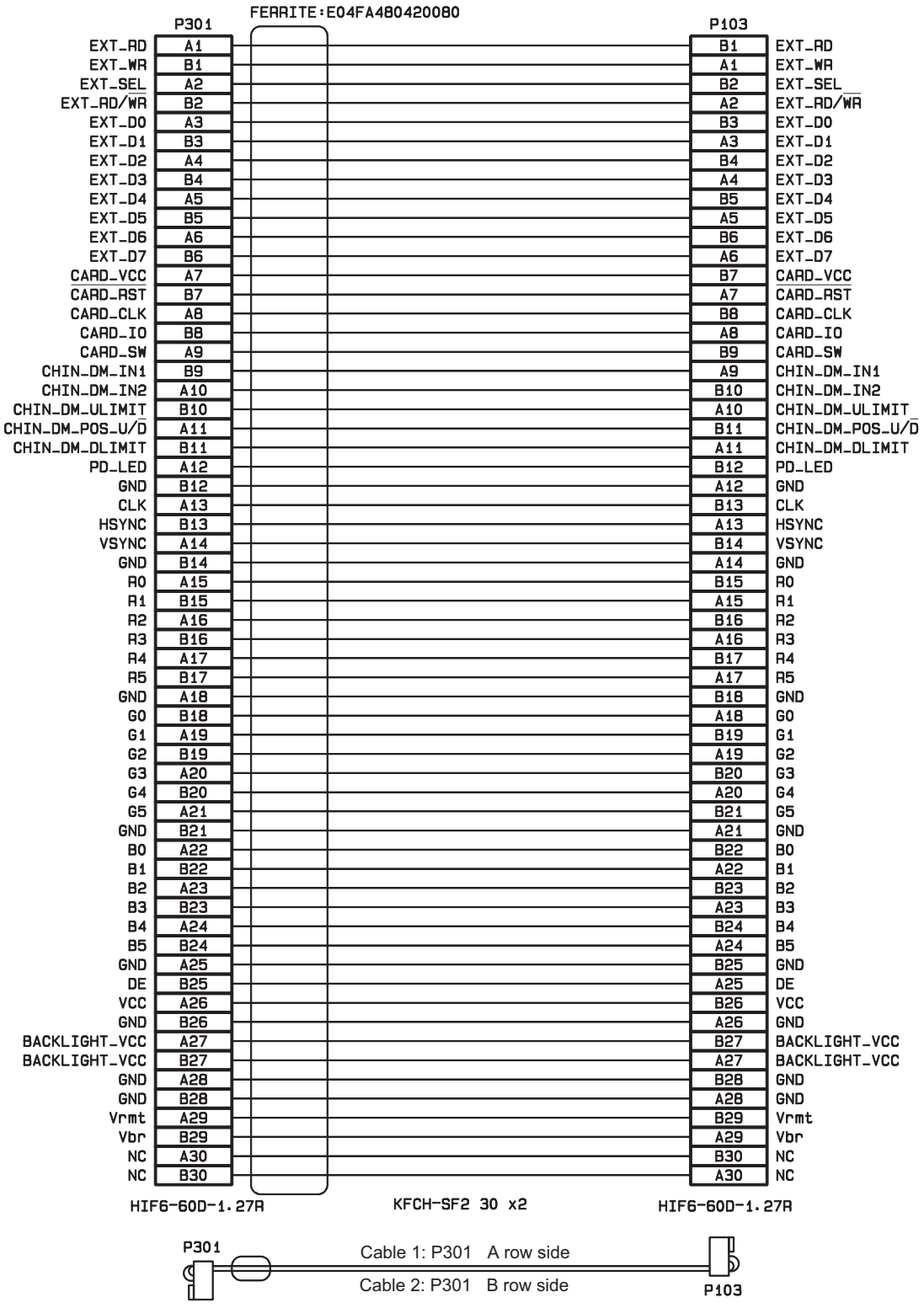
30601-EA11



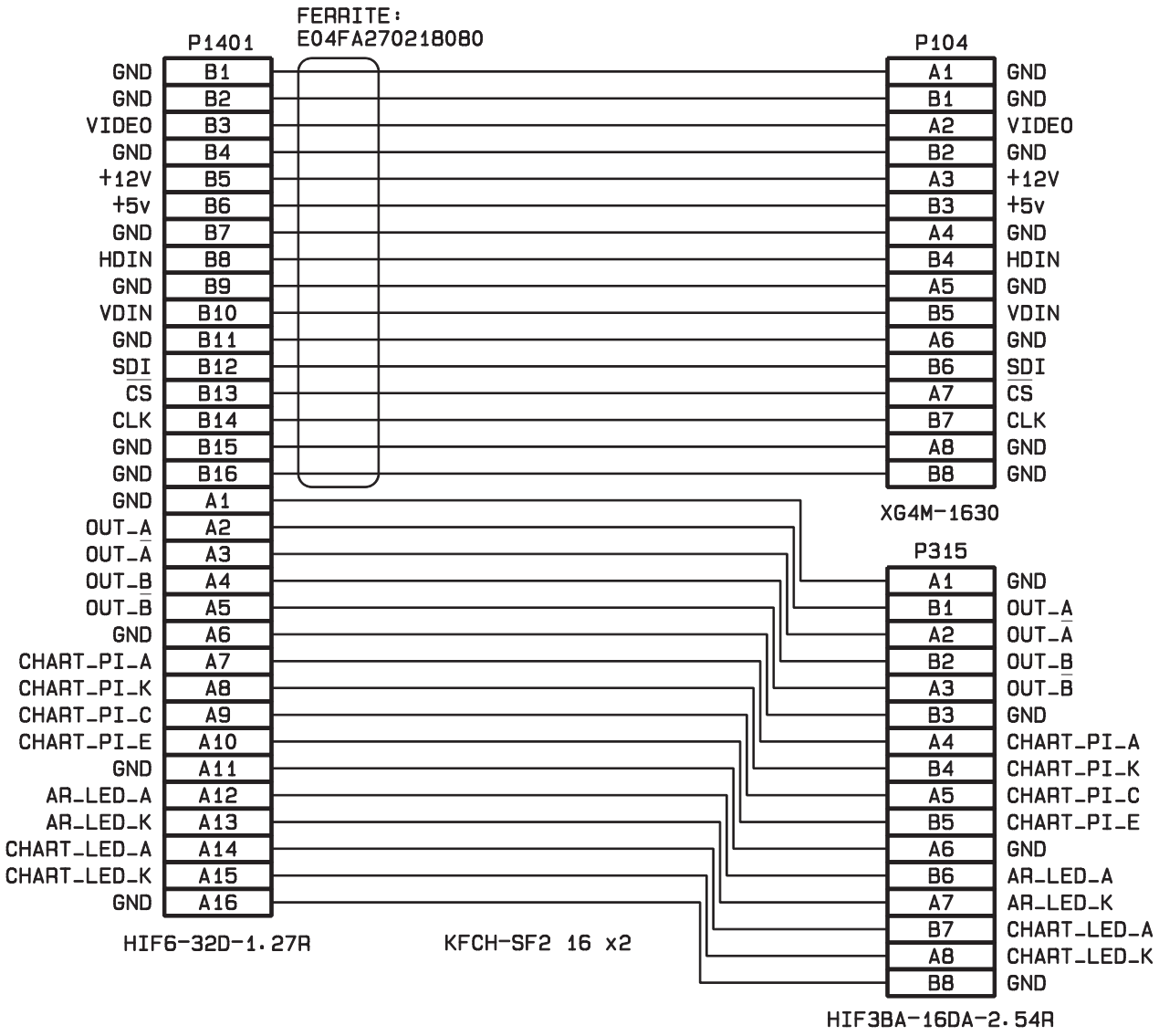
30601-EA12

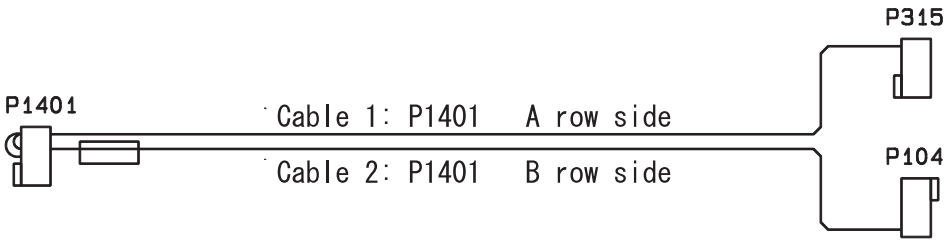


30601-EA13

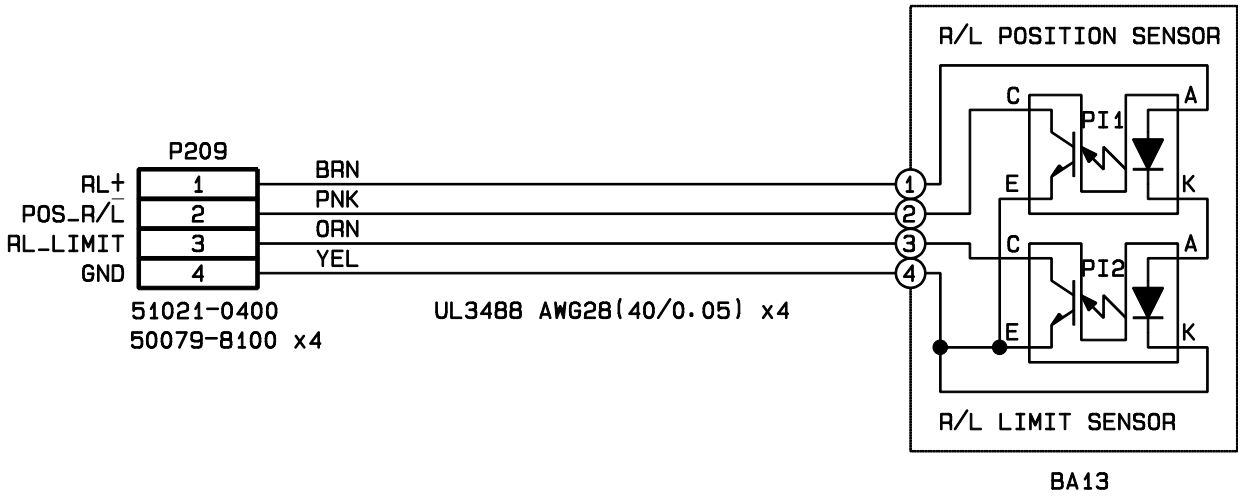

FERRITE:E04FA480420080
P301
P103
EXT_RD A1 B1 EXT_RD
EXT_WR B1 A1 EXT_WR
EXT_SEL A2 B2 EXT_SEL
EXT_RD/WR B2 A2 EXT_RD/WR
EXT_D0 A3 B3 EXT_D0
EXT_D1 B3 A3 EXT_D1
EXT_D2 A4 B4 EXT_D2
EXT_D3 B4 A4 EXT_D3
EXT_D4 A5 B5 EXT_D4
EXT_D5 B5 A5 EXT_D5
EXT_D6 A6 B6 EXT_D6
EXT_D7 B6 A6 EXT_D7
CARD_VCC A7 B7 CARD_VCC
CARD_RST B7 A7 CARD_RST
CARD_CLK A8 B8 CARD_CLK
CARD_IO B8 A8 CARD_IO
CARD_SW A9 B9 CARD_SW
CHIN_DM_IN1 B9 A9 CHIN_DM_IN1
CHIN_DM_IN2 A10 B10 CHIN_DM_IN2
CHIN_DM_ULIMIT B10 A10 CHIN_DM_ULIMIT
CHIN_DM_POS_U/D A11 B11 CHIN_DM_POS_U/D
CHIN_DM_DLIMIT B11 A11 CHIN_DM_DLIMIT
PD_LED A12 B12 PD_LED
GND B12 A12 GND
CLK A13 B13 CLK
HSYNC B13 A13 HSYNC
VSYNC A14 B14 VSYNC
GND B14 A14 GND
R0 A15 B15 R0
R1 B15 A15 R1
R2 A16 B16 R2
R3 B16 A16 R3
R4 A17 B17 R4
R5 B17 A17 R5
GND A18 B18 GND
G0 B18 A18 G0
G1 A19 B19 G1
G2 B19 A19 G2
G3 A20 B20 G3
G4 B20 A20 G4
G5 A21 B21 G5
GND B21 A21 GND
B0 A22 B22 B0
B1 B22 A22 B1
B2 A23 B23 B2
B3 B23 A23 B3
B4 A24 B24 B4
B5 B24 A24 B5
GND A25 B25 GND
DE B25 A25 DE
VCC A26 B26 VCC
GND B26 A26 GND
BACKLIGHT_VCC A27 B27 BACKLIGHT_VCC
BACKLIGHT_VCC B27 A27 BACKLIGHT_VCC
GND A28 B28 GND
GND B28 A28 GND
Vrmt A29 B29 Vrmt
Vbr B29 A29 Vbr
NC A30 B30 NC
NC B30 A30 NC
HIF6-60D-1.27R
KFCH-SF2 30 x2
HIF6-60D-1.27R
P301
Cable 1: P301 A row side
Cable 2: P301 B row side
P103

30601-EA14

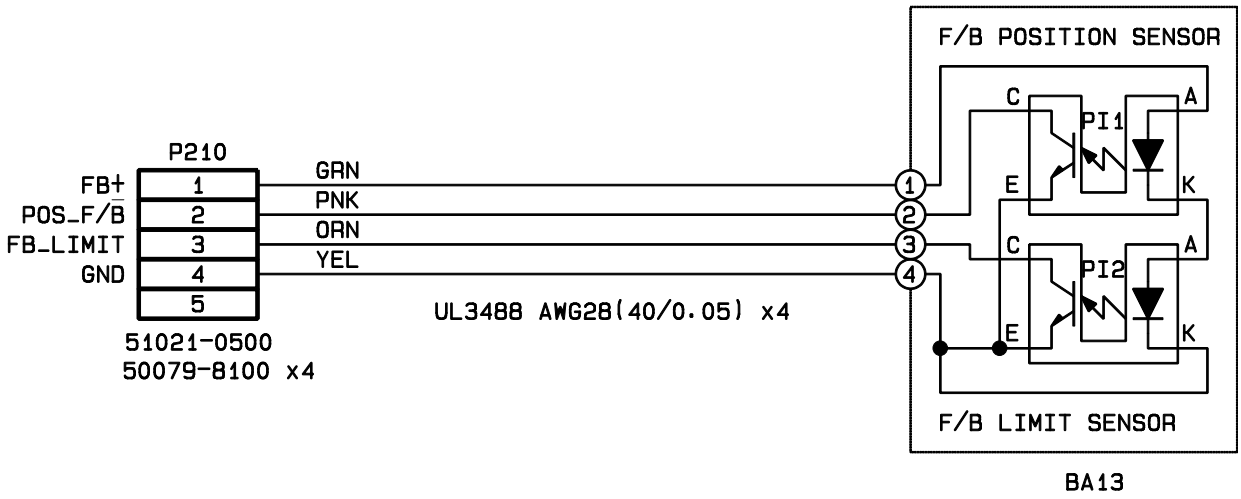

FERRITE:
E04FA270218080
P1401
GND B1
GND B2
VIDEO B3
GND B4
+12V B5
+5v B6
GND B7
HDIN B8
GND B9
VDIN B10
GND B11
SDI B12
CS B13
CLK B14
GND B15
GND B16
GND A1
OUT_A A2
OUT_A A3
OUT_B A4
OUT_B A5
GND A6
CHART_PI_A A7
CHART_PI_K A8
CHART_PI_C A9
CHART_PI_E A10
GND A11
AR_LED_A A12
AR_LED_K A13
CHART_LED_A A14
CHART_LED_K A15
GND A16
HIF6-32D-1.27R
KFCH-SF2 16 x2
P104
A1 GND
B1 GND
A2 VIDEO
B2 GND
A3 +12V
B3 +5v
A4 GND
B4 HDIN
A5 GND
B5 VDIN
A6 GND
B6 SDI
A7 CS
B7 CLK
A8 GND
B8 GND
XG4M-1630
P315
A1 GND
B1 OUT_A
A2 OUT_A
B2 OUT_B
A3 OUT_B
B3 GND
A4 CHART_PI_A
B4 CHART_PI_K
A5 CHART_PI_C
B5 CHART_PI_E
A6 GND
B6 AR_LED_A
A7 AR_LED_K
B7 CHART_LED_A
A8 CHART_LED_K
B8 GND
HIF3BA-16DA-2.54R


P315
P1401
Cable 1: P1401 A row side
Cable 2: P1401 B row side
P104

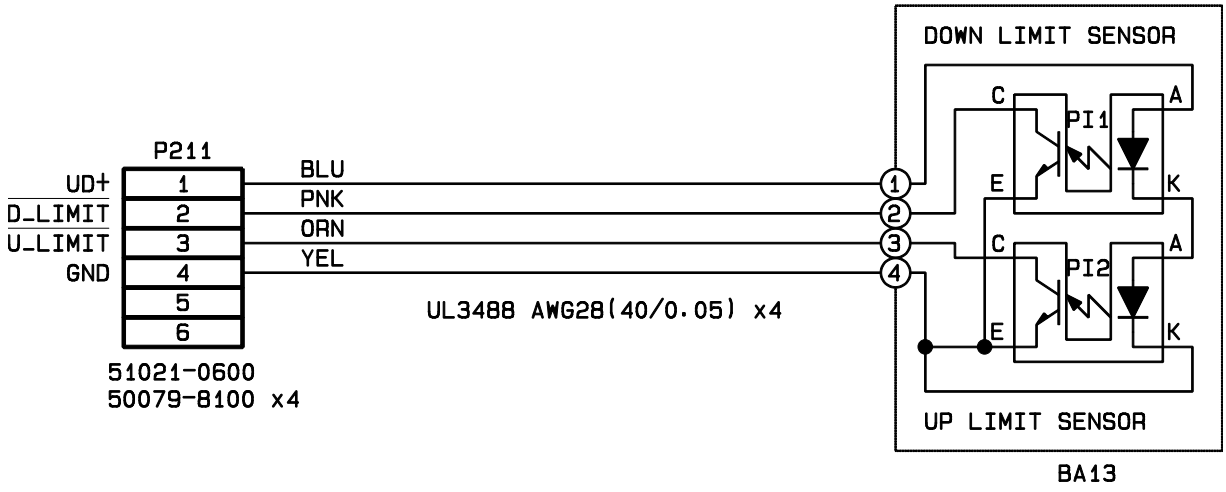
30601-EA20 (AR-330A, ARK-530A, ARK-560A only)



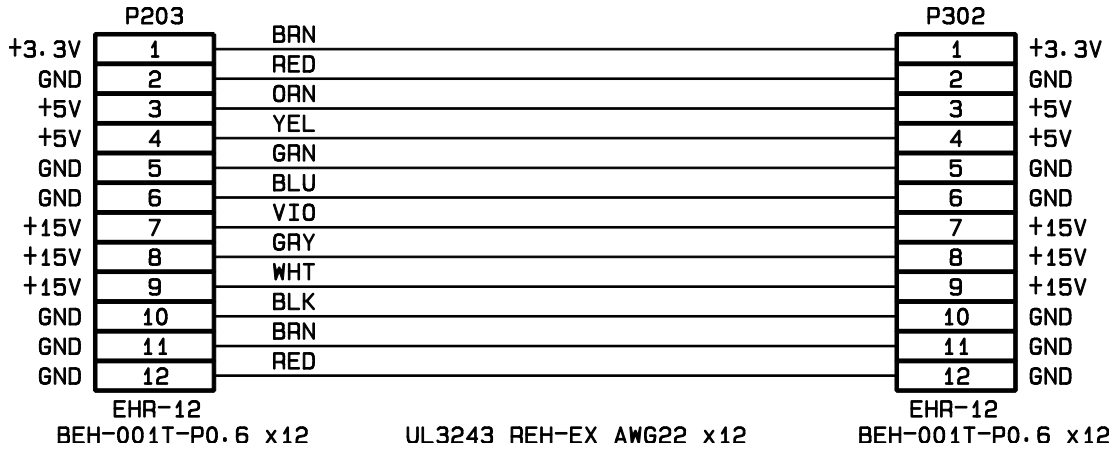
30602-EA21 (AR-330A, ARK-530A, ARK-560A only)



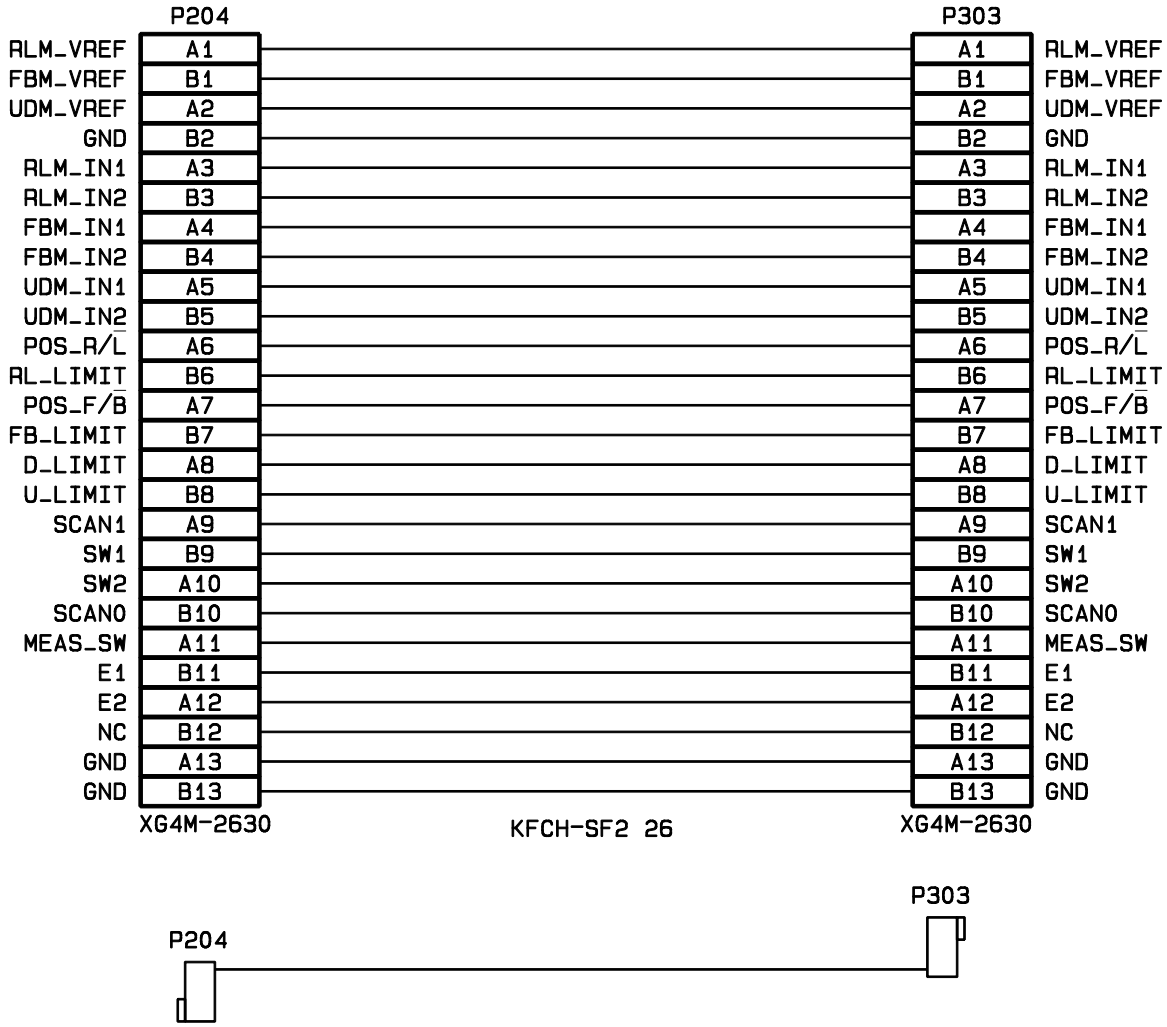
30601-EA22



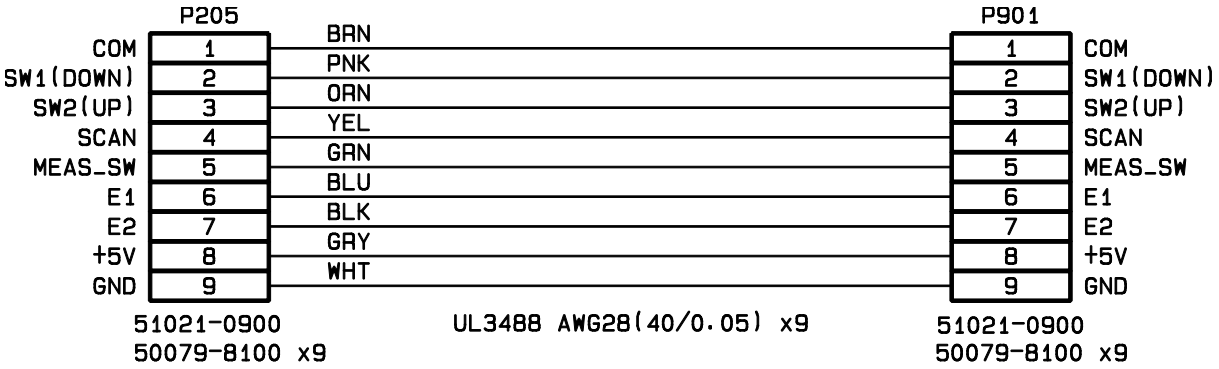
30601-EA23



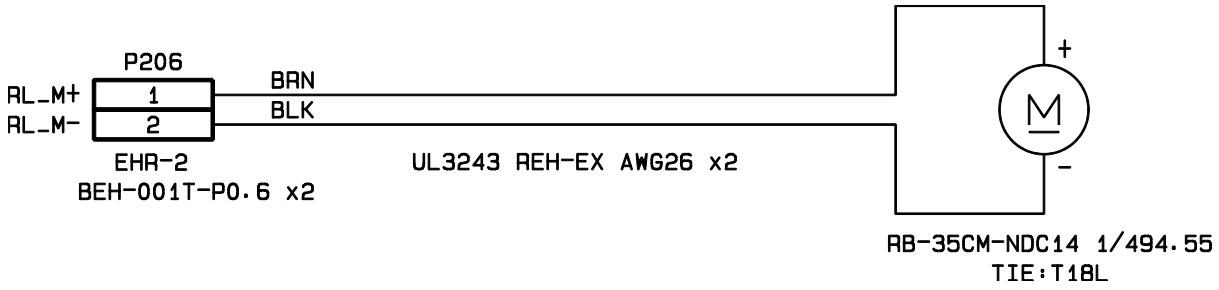
30601-EA24



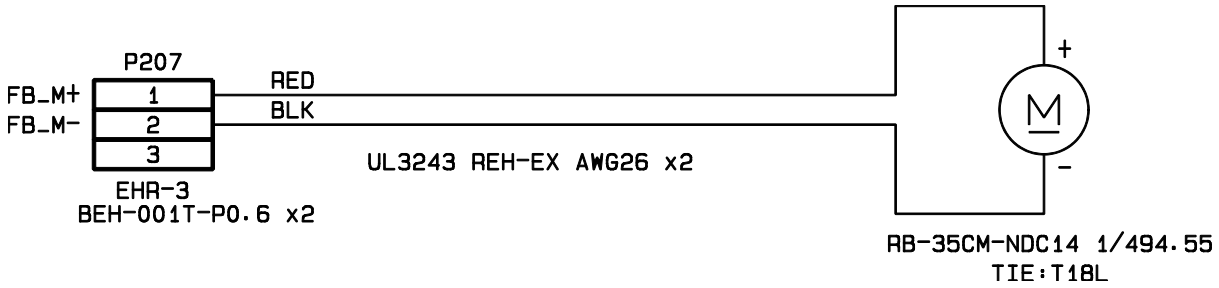
30601-EA25



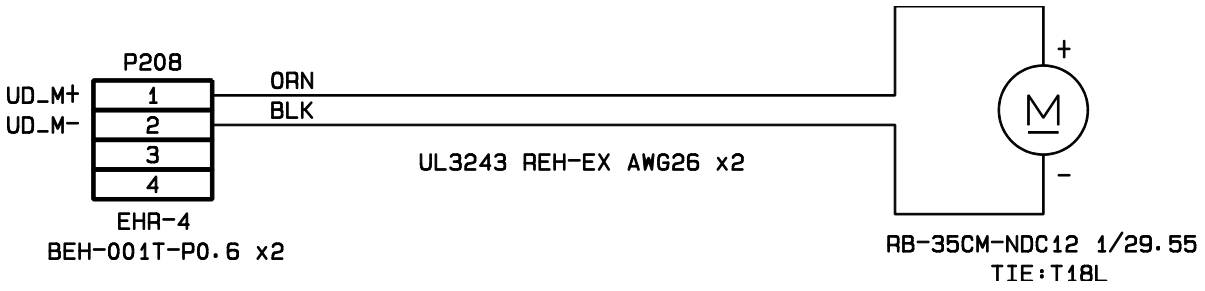
30602-EA26 (AR-330A, ARK-530A, ARK-560A only)



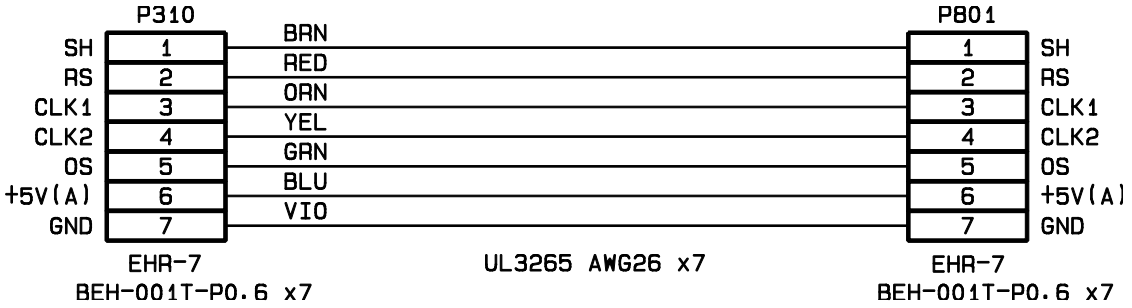
30602-EA27 (AR-330A, ARK-530A, ARK-560A only)



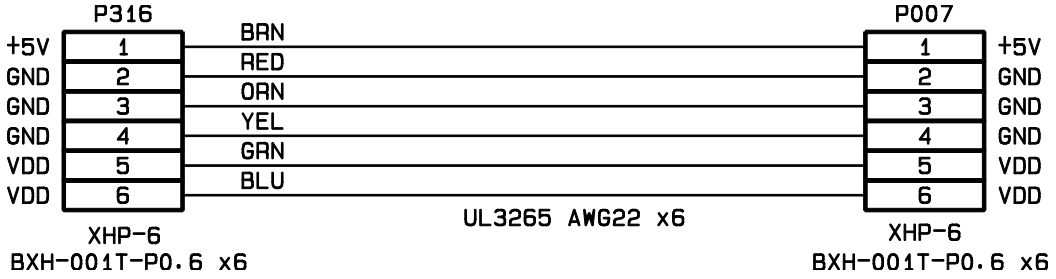
30601-EA28



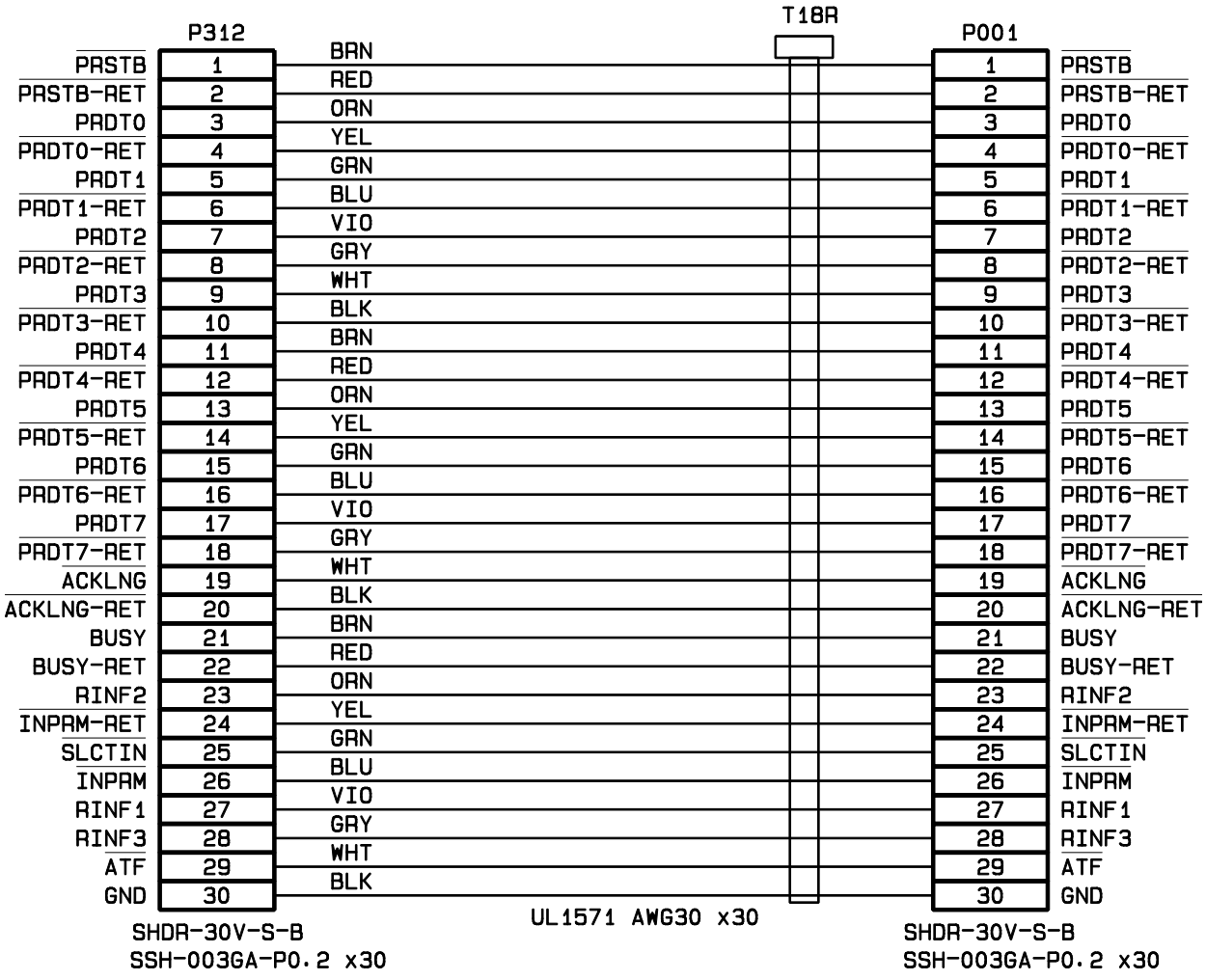
30601-EA30



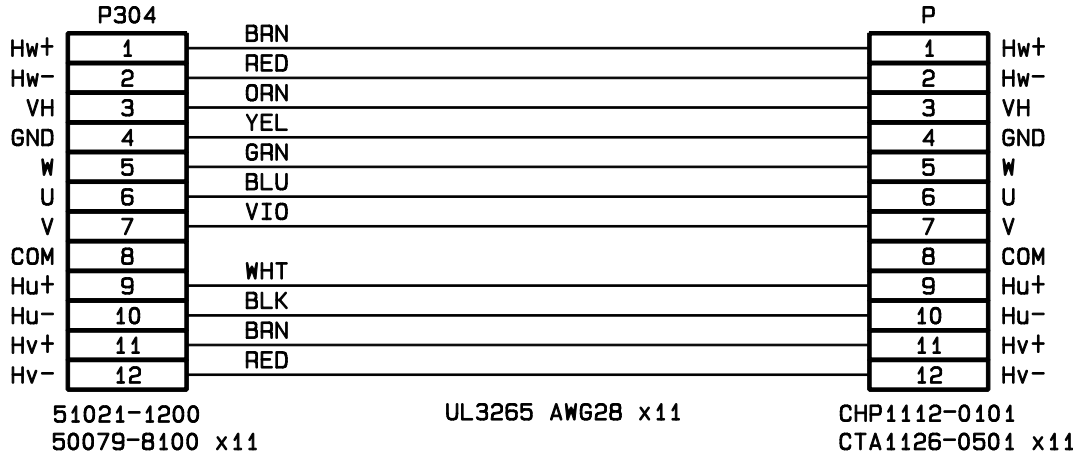
30601-EA31



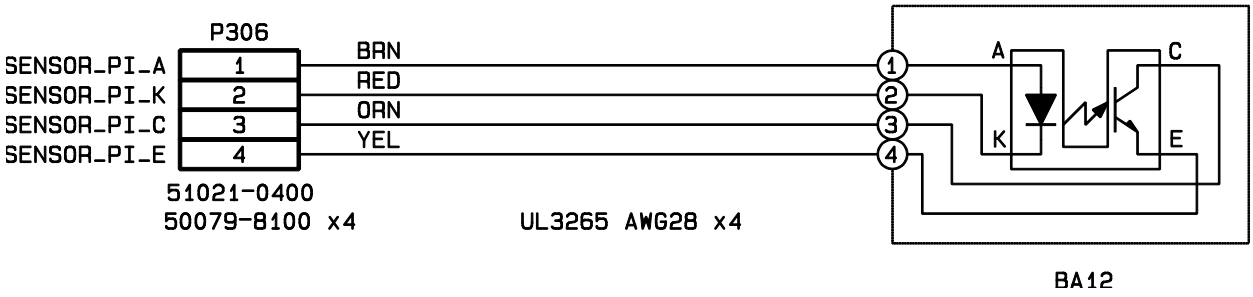
30601-EA32



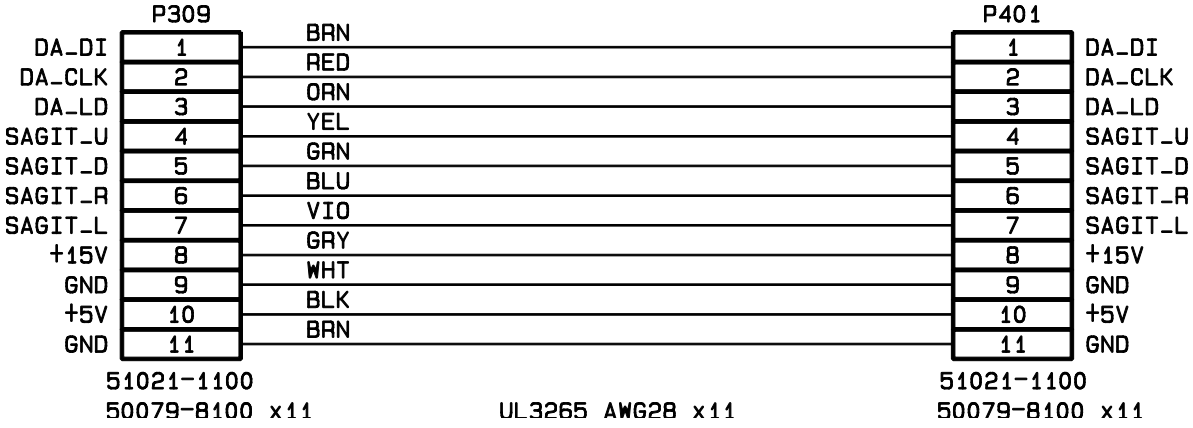
30601-EA34



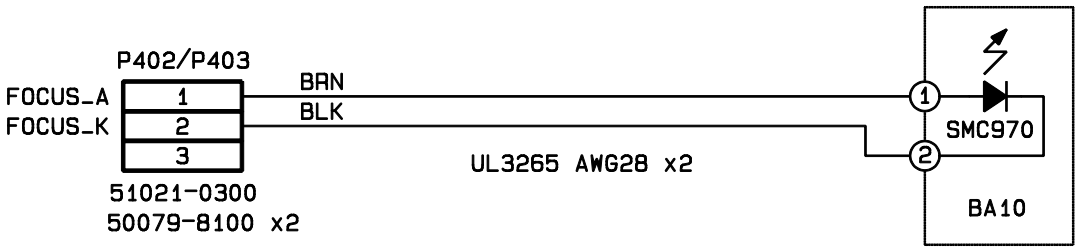
30601-EA36



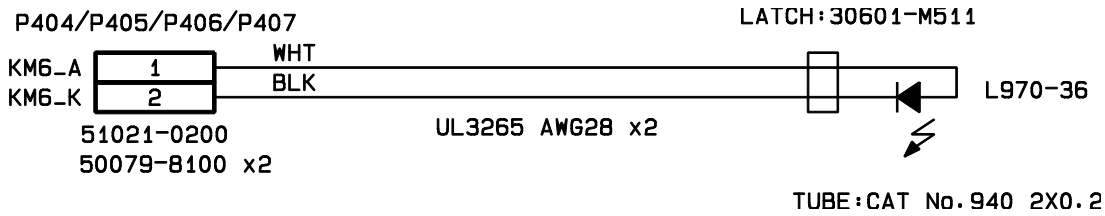
30601-EA39



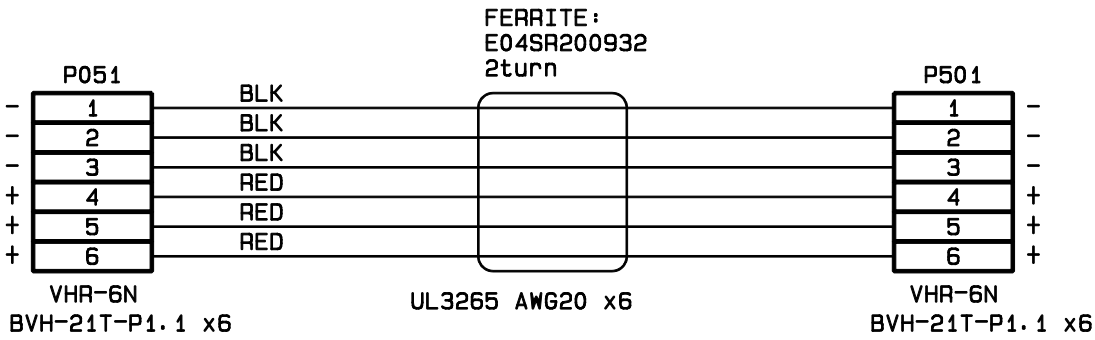
30601-EA42



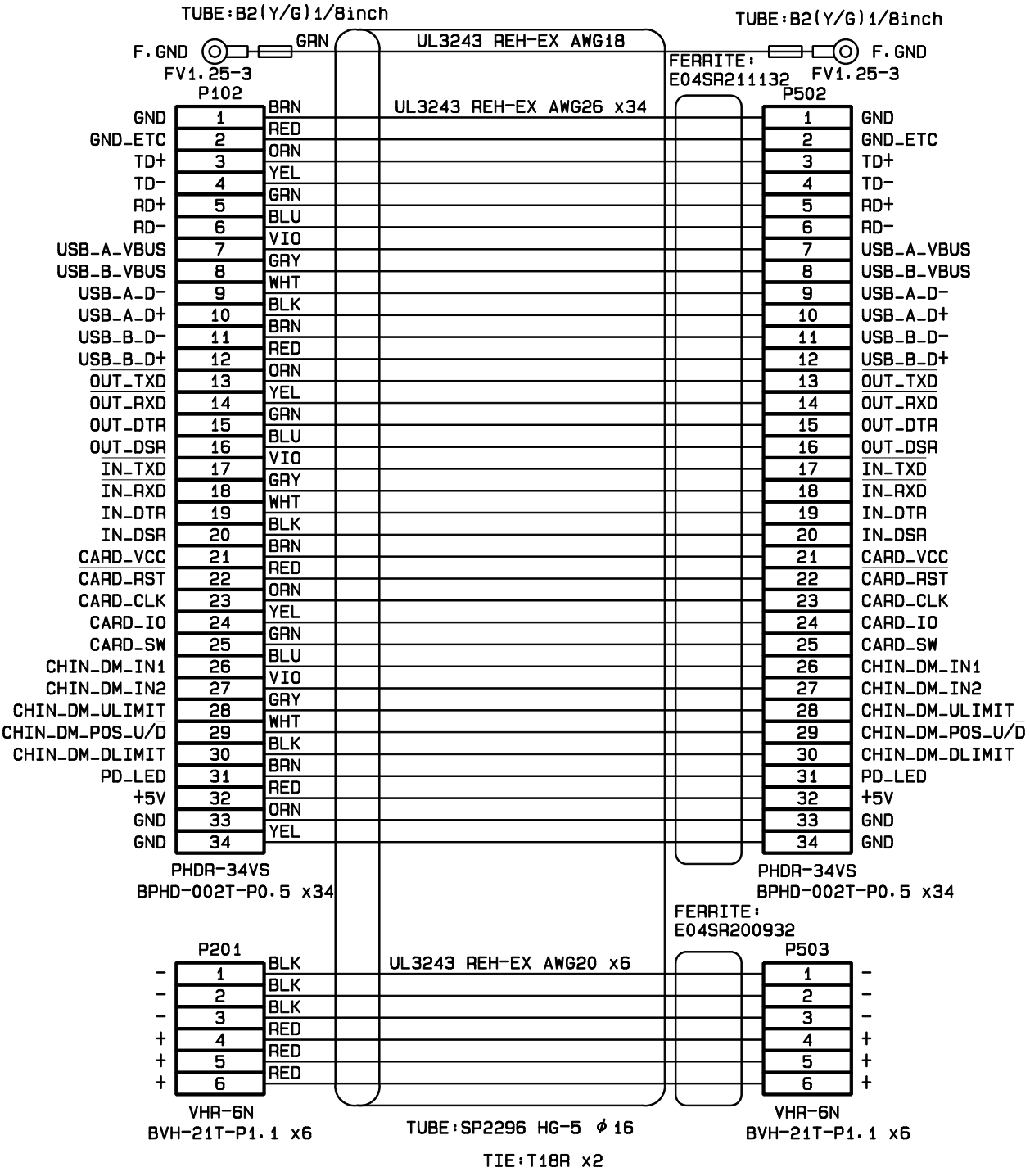
30601-EA44



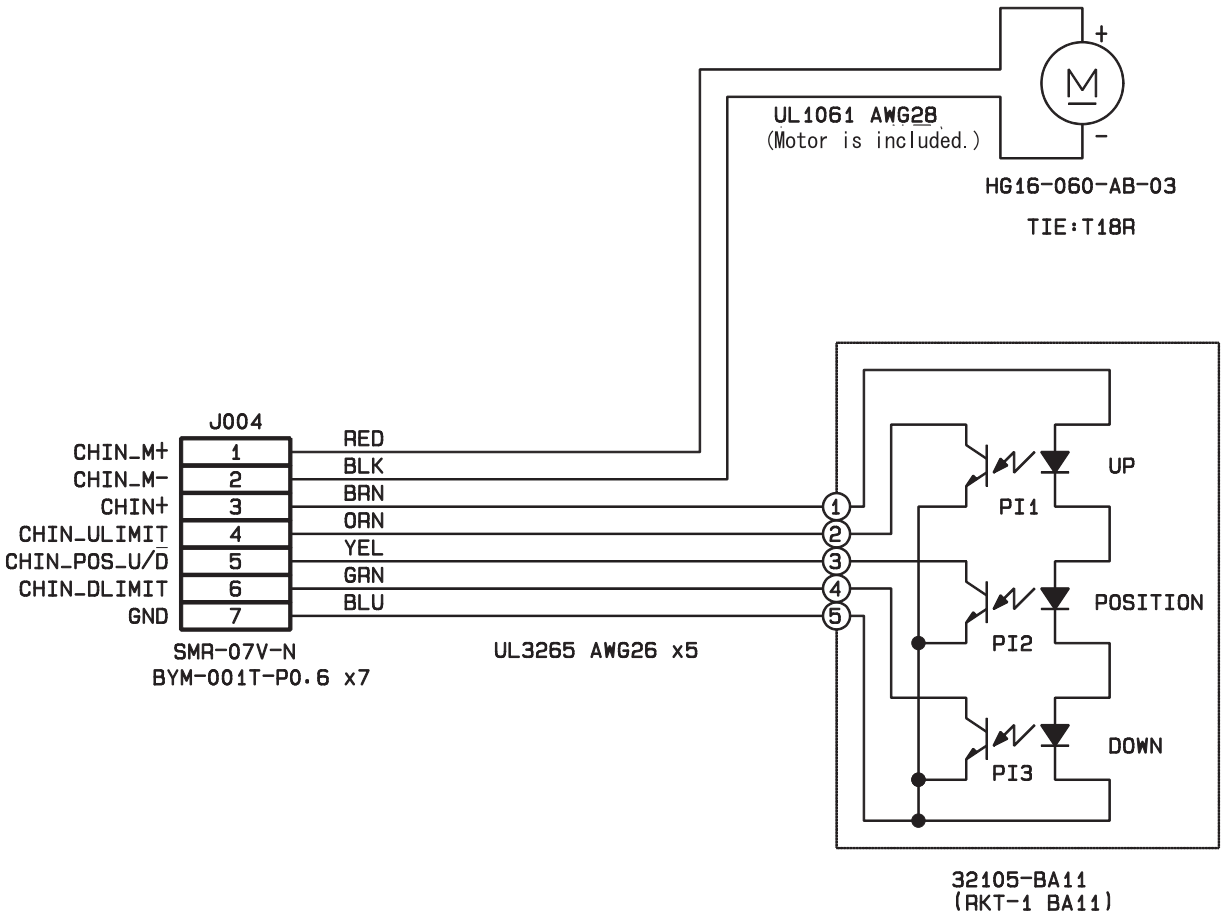
30601-EA51



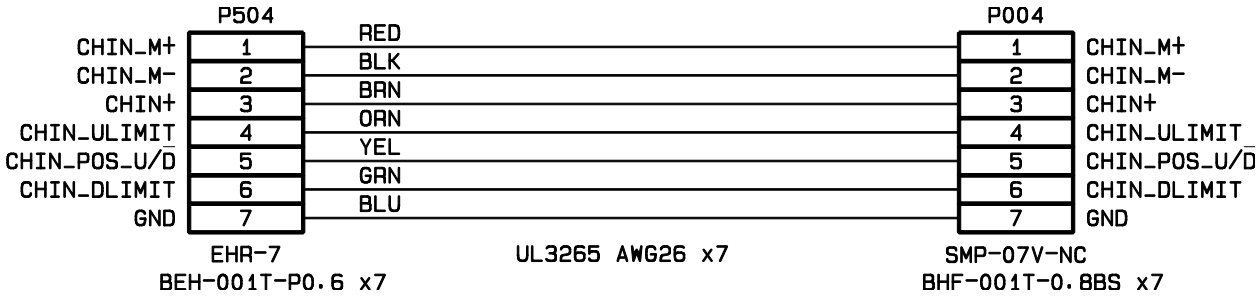
30601-EA52


TUBE:B2(Y/G)1/8inch
F.GND
GRN
FV1.25-3
P102
UL3243 REH-EX AWG18
UL3243 REH-EX AWG26 x34
TUBE:B2(Y/G)1/8inch
FERRITE:
E04SR211132
F.GND
FV1.25-3
P502
GND 1 BRN
GND_ETC 2 RED
TD+ 3 ORN
TD- 4 YEL
RD+ 5 GRN
RD- 6 BLU
USB_A_VBUS 7 VIO
USB_B_VBUS 8 GRY
USB_A_D- 9 WHT
USB_A_D+ 10 BLK
USB_B_D- 11 BRN
USB_B_D+ 12 RED
OUT_TXD 13 ORN
OUT_RXD 14 YEL
OUT_DTR 15 GRN
OUT_DSR 16 BLU
IN_TXD 17 VIO
IN_RXD 18 GRY
IN_DTR 19 WHT
IN_DSR 20 BLK
CARD_VCC 21 BRN
CARD_RST 22 RED
CARD_CLK 23 ORN
CARD_IO 24 YEL
CARD_SW 25 GRN
CHIN_DM_IN1 26 BLU
CHIN_DM_IN2 27 VIO
CHIN_DM_ULIMIT 28 GRY
CHIN_DM_POS_U/D 29 WHT
CHIN_DM_DLIMIT 30 BLK
PD_LED 31 BRN
+5V 32 RED
GND 33 ORN
GND 34 YEL
1 GND
2 GND_ETC
3 TD+
4 TD-
5 RD+
6 RD-
7 USB_A_VBUS
8 USB_B_VBUS
9 USB_A_D-
10 USB_A_D+
11 USB_B_D-
12 USB_B_D+
13 OUT_TXD
14 OUT_RXD
15 OUT_DTR
16 OUT_DSR
17 IN_TXD
18 IN_RXD
19 IN_DTR
20 IN_DSR
21 CARD_VCC
22 CARD_RST
23 CARD_CLK
24 CARD_IO
25 CARD_SW
26 CHIN_DM_IN1
27 CHIN_DM_IN2
28 CHIN_DM_ULIMIT
29 CHIN_DM_POS_U/D
30 CHIN_DM_DLIMIT
31 PD_LED
32 +5V
33 GND
34 GND
PHDR-34VS
BPHD-002T-P0.5 x34
PHDR-34VS
BPHD-002T-P0.5 x34
FERRITE:
E04SR200932
P201
P503
- 1 BLK
- 2 BLK
- 3 BLK
+ 4 RED
+ 5 RED
+ 6 RED
UL3243 REH-EX AWG20 x6
1 -
2 -
3 -
4 +
5 +
6 +
VHR-6N
BVH-21T-P1.1 x6
VHR-6N
BVH-21T-P1.1 x6
TUBE:SP2296 HG-5 φ16
TIE:T18R x2

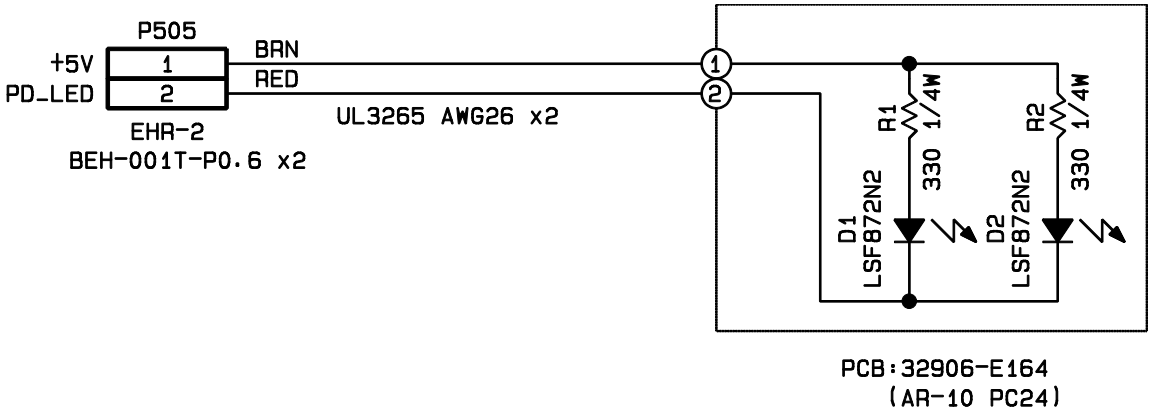
30601-EA53



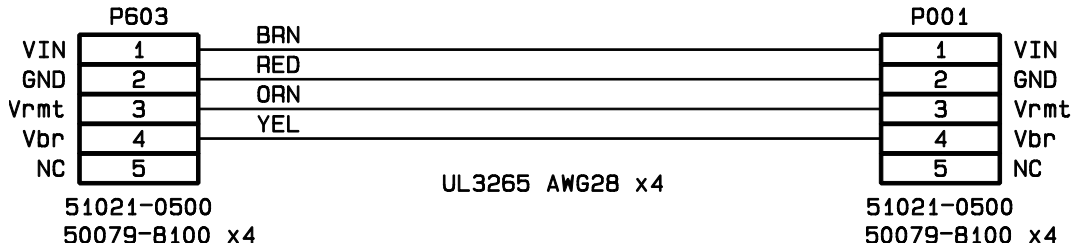
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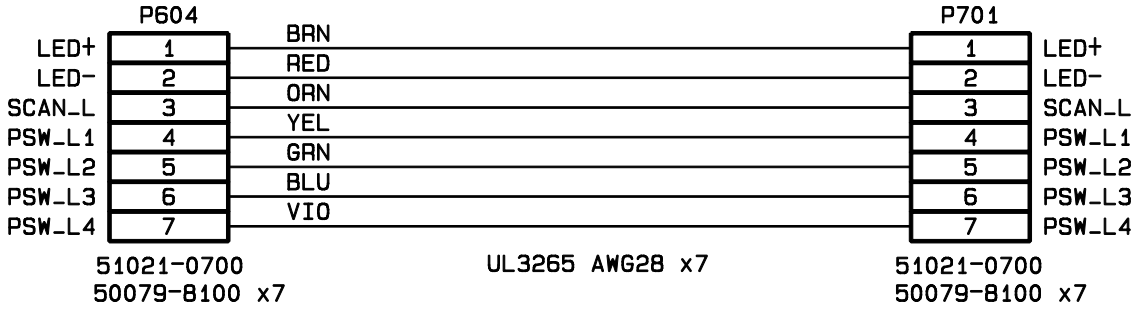
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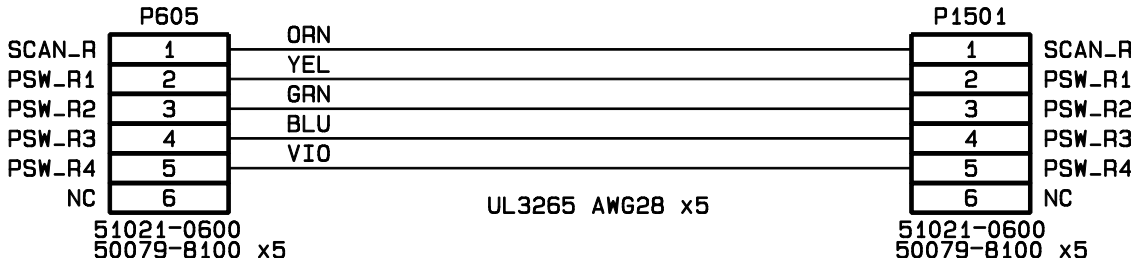
30601-EA63



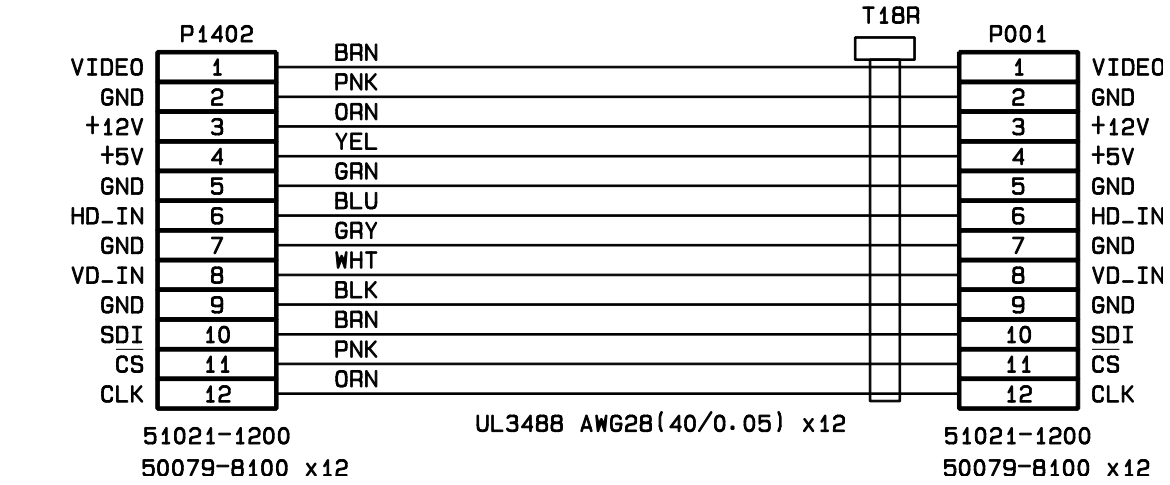
30601-EA64



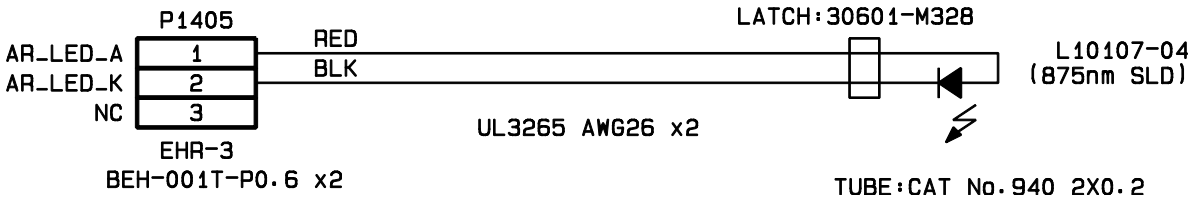
30601-EA65



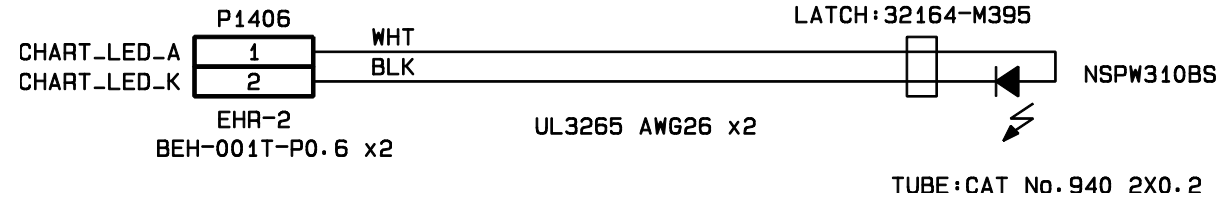
30601-EA72



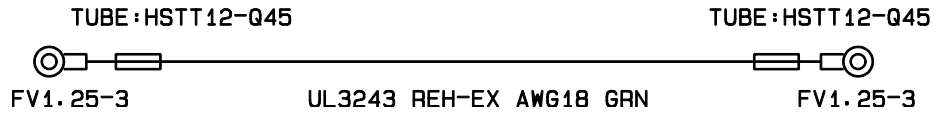
30601-EA75



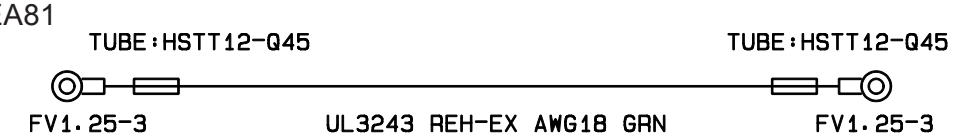
30601-EA76



30601-EA80



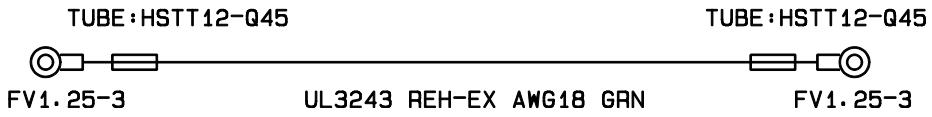
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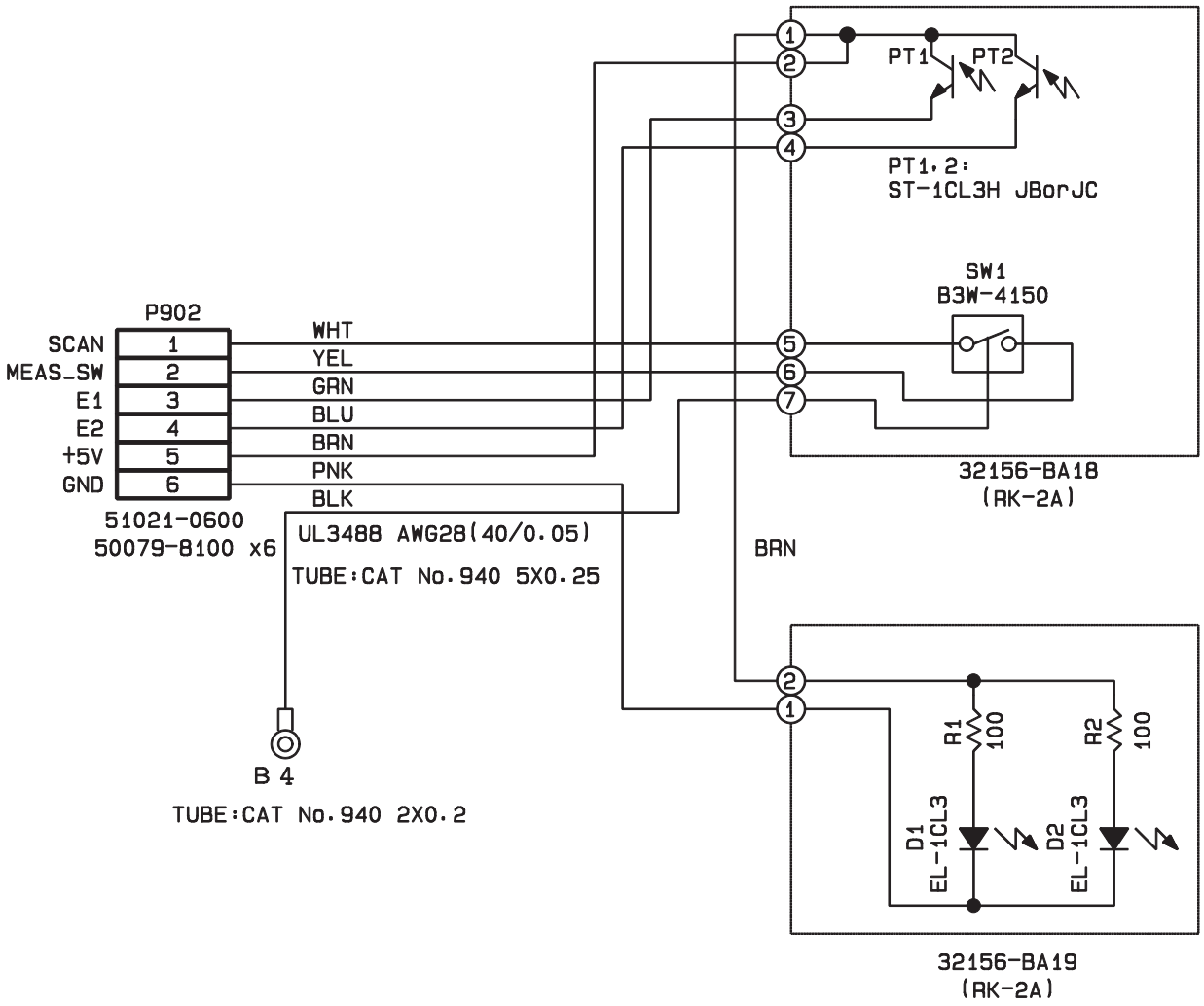
30601-EA82



30601-EA83

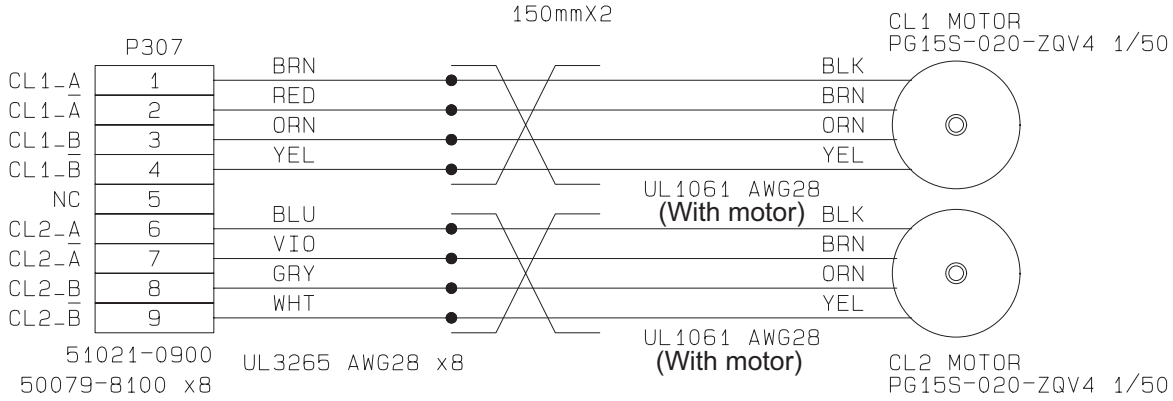


303601-EA92

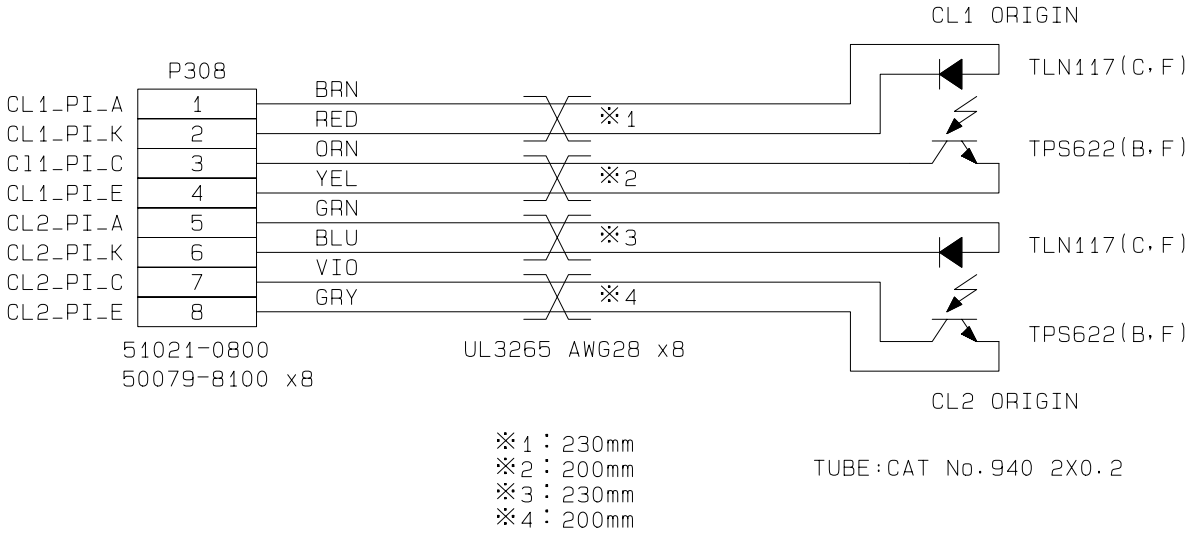


32156-BA1B and 32156-BA19 are not included in EA92.

30703-EA37



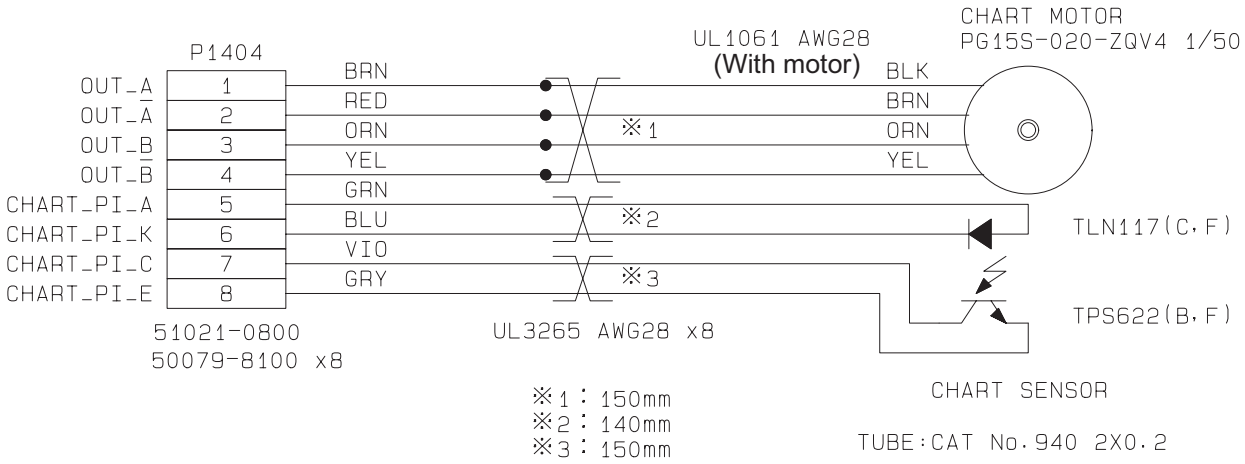
30703-EA38



※1：230mm
※2：200mm
※3：230mm
※4：200mm

TUBE:CAT No.940 2X0.2

30703-EA74

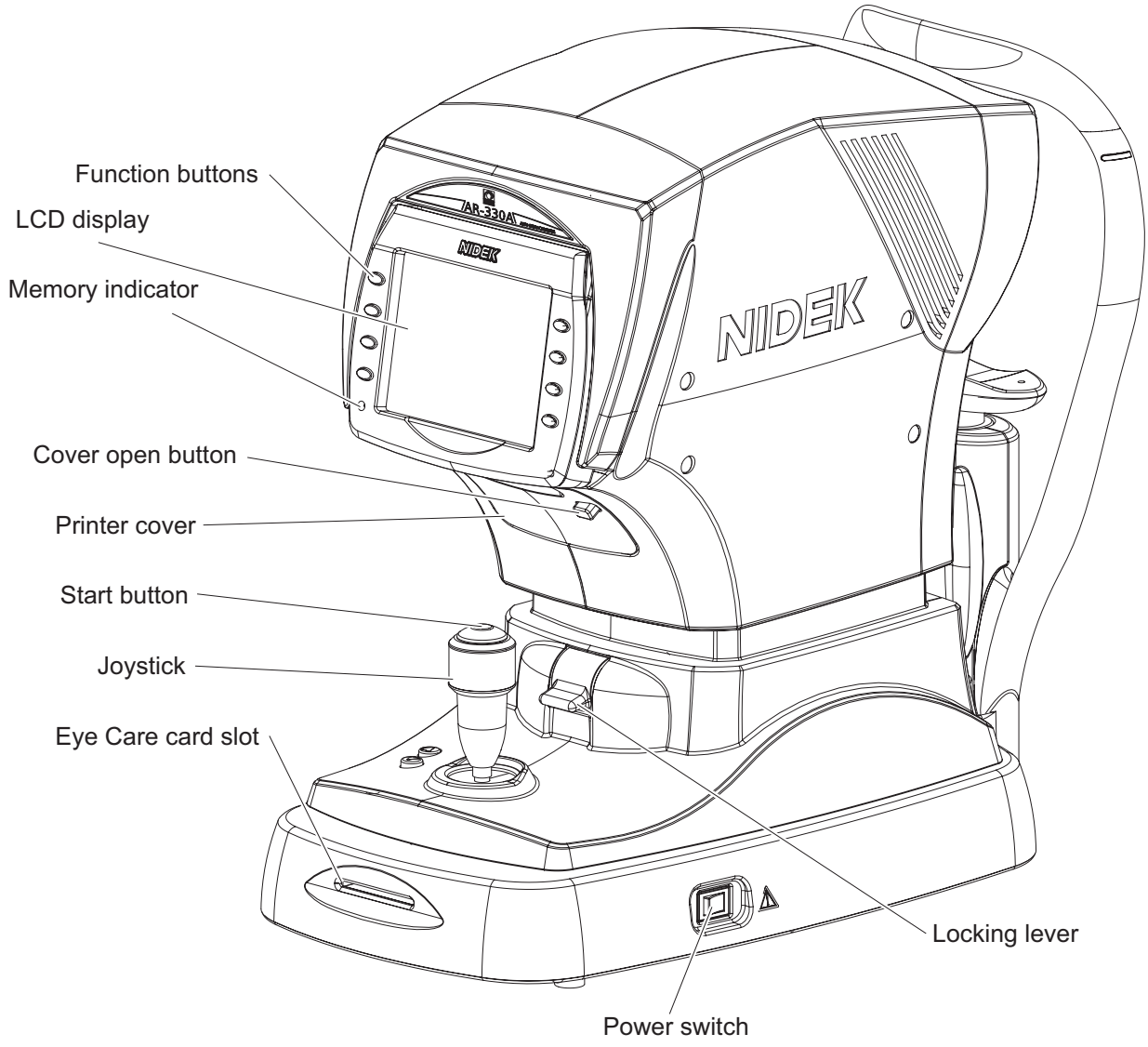


※1：150mm
※2：140mm
※3：150mm

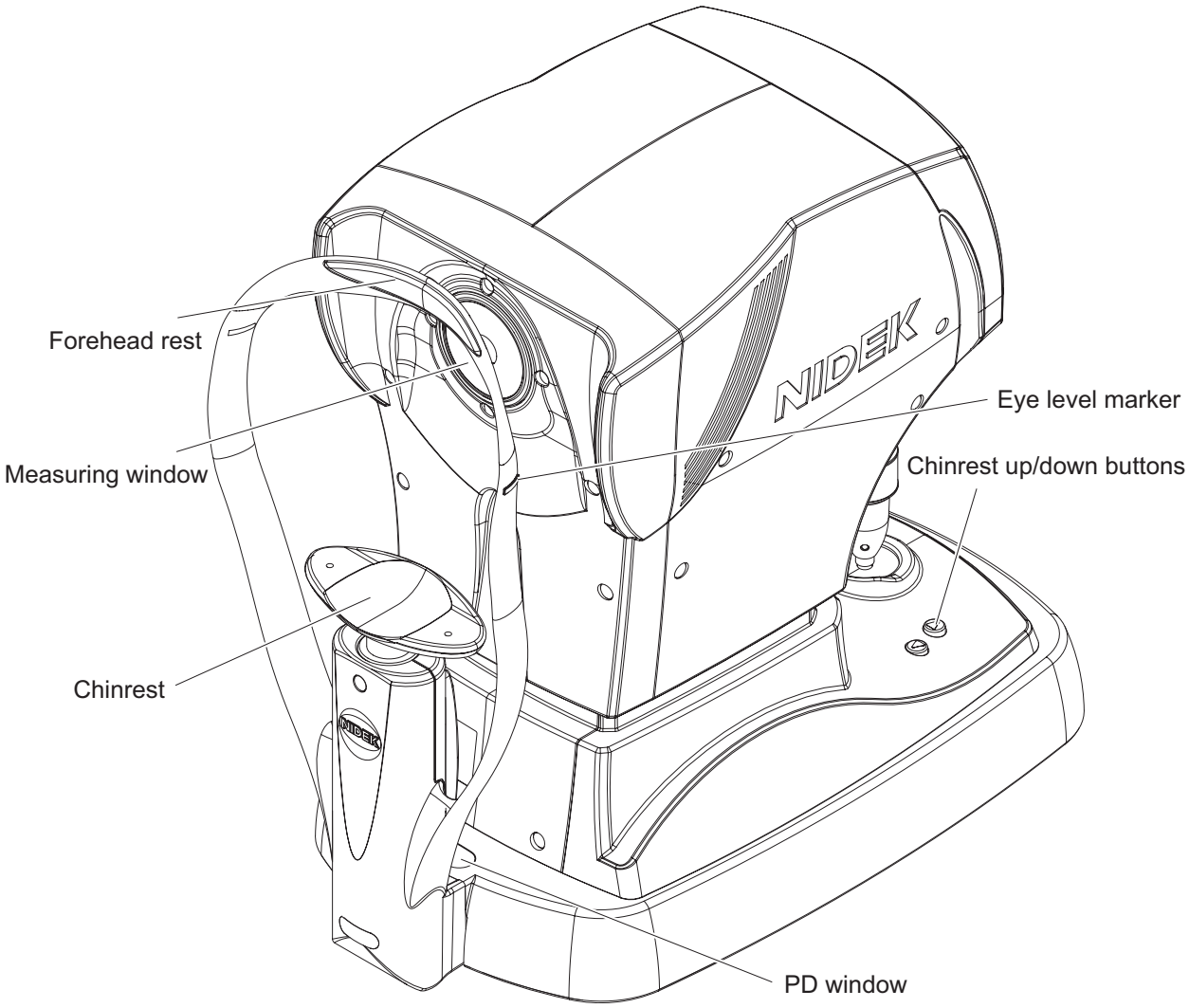
TUBE:CAT No.940 2X0.2

8.3 Configuration

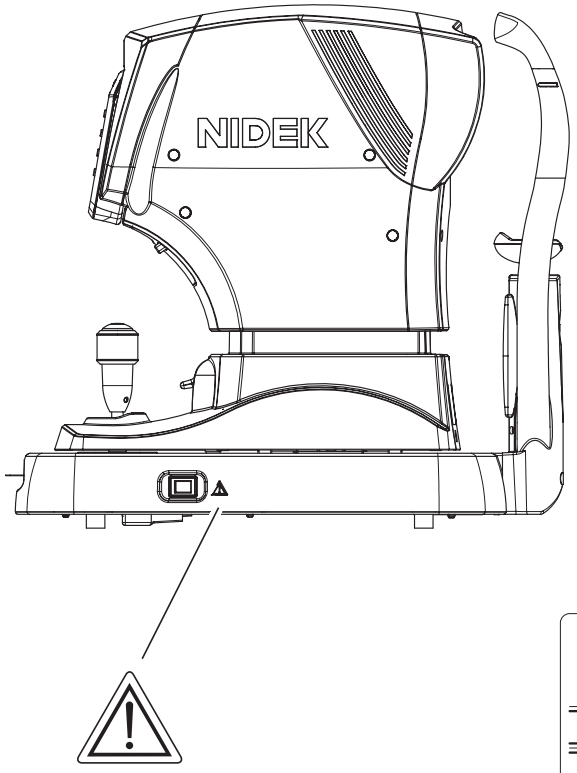
Front view

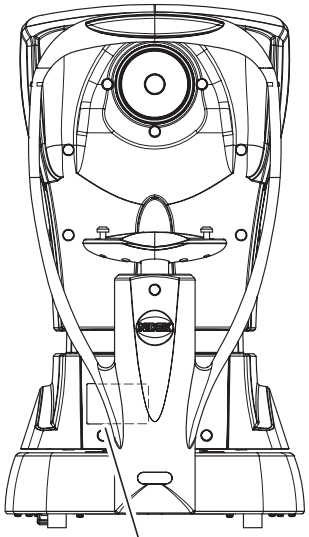


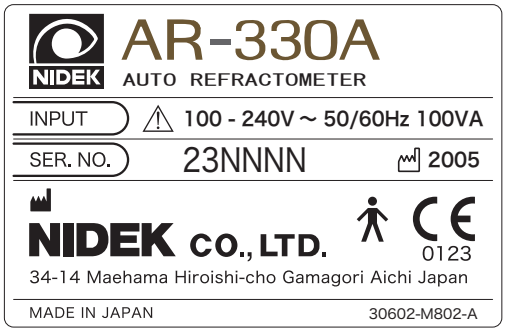
Rear view


Forehead rest
Measuring window
Chinrest
Eye level marker
Chinrest up/down buttons
PD window
NIDEK

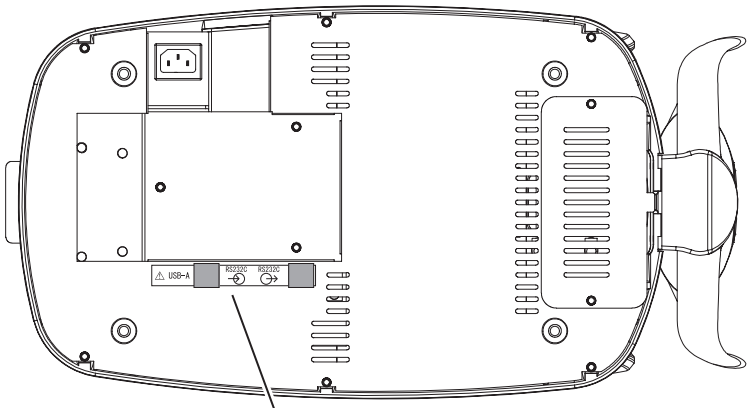
8.4 Labels

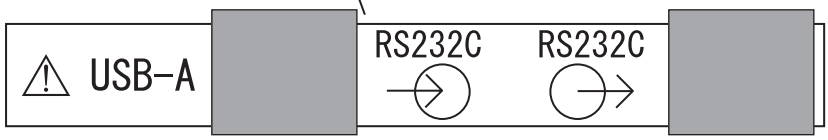




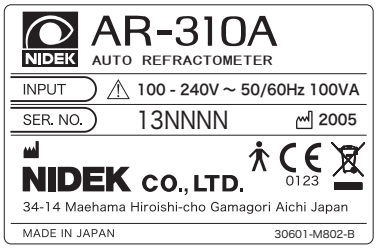
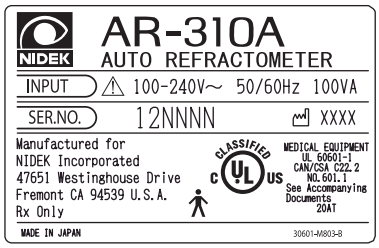
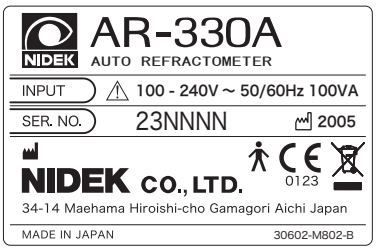
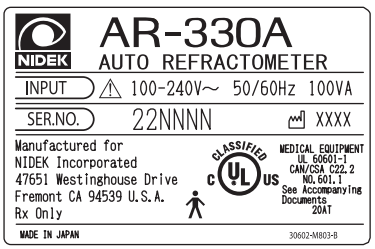
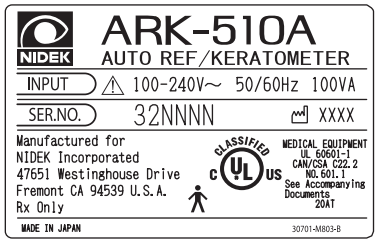
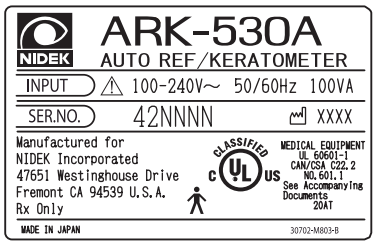
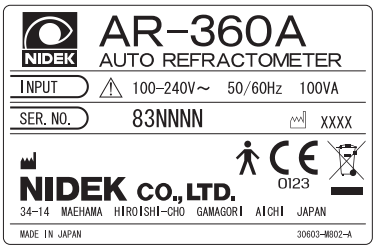
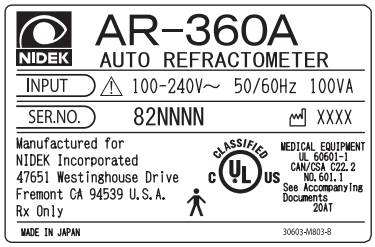
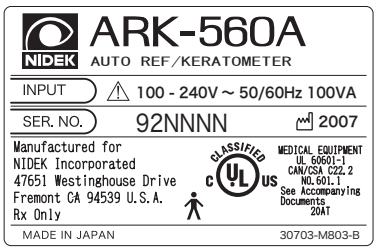


* See the next page for the detailed ID labels.





ID label list

Model \ Destination	Europe	INC
AR-310A		
AR-330A		
ARK-510A		
ARK-530A		
AR-360A		
ARK-560A		

8.5 Error Messages

Error codes	Contents	Details
ERR001	EEPROM error	Defective data of the EEPROM
ERR002	Clock error	Defective IC data of the clock
PD ERROR	PD error	Defective PD CCD, LED does not light up.
ERR011	Time-out error (OUT) in characters	Communication breaks during receiving data.
ERR012	Time-out error (OUT) for receiving data	Time-out after the DTR-DSR is effected
ERR013	Receiving error (OUT)	Parity and flaming error
ERR014	Receiving code error (OUT)	Received code is defective.
ERR015	Reply time-out (OUT)	Time-out error between sending and receiving
ERR016	DTR-DSR error (OUT)	Time-out between DTR and DSR
ERR017	Data error (OUT)	Data error (Improper received data)
ERR018	Command error (OUT)	Command error (Improper command)
ERR019	Data empty (OUT)	No measurement data
ERR021	Time-out error (IN) in characters	DSR is not flagged while receiving SD command.
ERR022	Time-out error (IN) for receiving data	DSR is not flagged while sending SD command.
ERR023	Receiving error (IN)	Received data does not come.
ERR024	Receiving code error (IN)	Receiving buffer is full.
ERR025	Reply time-out (IN)	Unreadable command was entered.
ERR026	DTR-DSR error (IN)	
ERR027	Data error (IN)	
ERR028	Command error (IN)	
ERR031	Up-and-down tracking error	Time-out for up-and-down tracking
ERR032	Left-to-right tracking error	Time-out for left-to-right tracking
ERR033	Back-and-forth tracking error	Time-out for back-and-forth tracking
ERR034	Error in up-and-down movement of the chinrest	Time-out for up-and-down movement of the chinrest
NO PAPER	Printer paper shortage error	Printer is short of paper, or the printer head is raised.
		Printer head is raised.
ERR043	Printer connection error	Defective connection of printer or malfunction
ERR061	Model code mismatching error	
ERR062	Model code mismatching error	Board for AR-310A and board for AR 330A are assembled Board for ARK-510A and board for ARK-530A are assembled
ERR063	Model code mismatching error	BA01 board for AR series and BA03 board for ARK series are assembled
ERR064	Model code mismatching error	BA03 board for AR series and BA01 board for ARK series are assembled
ERR065	BA03 model code error	BA03boards of AR-310A, 330A, and 360A are replaced.

Error codes	Contents	Details
ERR066	BA03 model code error	BA03boards of ARK-510A, 530A, and 560A are replaced.
ERR067	BA01 model code error	BA01boards of AR-310A and 330A are replaced.
ERR068	BA01 model code error	BA01boards of ARK-510A and 530A are replaced.
ERR101	Sensor initialization error	Sensor does not work.
ERR111	Thermister error	Thermister is defective.
ERR112	AR motor error	Improper numbers of rotation in AR motor
ERR121	CYL1 initialization error	Initialization of subjective CYL lens1 cannot be completed.
ERR122	CYL2 initialization error	Initialization of subjective CYL lens2 cannot be completed.
ERR123	Chart initialization error	Initialization of subjective chart cannot be completed.
ERR501	Power error of EyeCare card	EyeCare card is defective.
ERR502	Writing error of EyeCare card	EyeCare card is ejected while writing.
ERR503	Power error of EyeCare card	Eyecare card is ejected after writing.
ERR601	USB_A recognizing error	USB host fails to be recognized.
ERR602	USB_A class error	USB host class is improper.

* For the details of ERR061 to ERR068 when the main board and driver board are combined, see the table below.

		Main board (30601-BA01)						
		Unwritten	AR-310A	AR-330A	AR-360A	ARK-510A	ARK-530A	ARK-560A
Driver board (30601-BA03)	Unwriteen	ERR061	ERR065	ERR065	ERR065	ERR066	ERR066	ERR066
	AR-310A	ERR067		ERR062	ERR062	ERR064	ERR064	ERR064
	AR-330A	ERR067	ERR062		ERR062	ERR064	ERR064	ERR064
	AR-360A	ERR067	ERR062	ERR062		ERR064	ERR064	ERR064
	ARK-510A	ERR068	ERR063	ERR063	ERR063		ERR062	ERR062
	ARK-530A	ERR068	ERR063	ERR063	ERR062	ERR062		ERR062
	ARK-560A	ERR068	ERR063	ERR063	ERR063	ERR062	ERR062	

8.6 Parameter List

8.6.1 AR-310A/AR-330A

Parameter item	No.	Item	JAPAN	FOREIGN	VON HOFF	OCULUS	INC	CHINA
AR	1	STEP	0.25D	0.25D	0.25D	0.25D	0.25D	0.25D
	2	VERTEX D.	12.00mm	12.00mm	12.00mm	12.00mm	13.75mm	12.00mm
	3	AXIS STEP	1°	1°	1°	1°	1°	1°
	4	MEAS MODE	Con.	Con.	Con.	Con.	Con.	Con.
	5	AI MODE	YES	YES	YES	YES	YES	YES
	6	AR CONTINUE	3	3	3	3	3	3
AR (AR-330A)	7	AR THUMBNAIL	YES	YES	YES	YES	YES	YES
COMPARE (AR-330A)	21	COMPARE SW	Manu.	Manu.	Manu.	Manu.	Manu.	Manu.
	22	COMPARE(AR)	SE	SE	SE	SE	SE	SE
	23	ADD SW	YES	YES	YES	YES	YES	YES
	24	ADD SELECT	1.75D	1.75D	1.75D	1.75D	1.75D	1.75D
PRINT1	31	PRINT	Manu.	Manu.	Manu.	Manu.	Manu.	Manu.
	32	ECONO . PRINT	NO	NO	NO	NO	NO	NO
	33	PRINT&CLEAR	NO	NO	NO	NO	NO	NO
	34	PRINT DENCITY	MIDDLE	MIDDLE	MIDDLE	MIDDLE	MIDDLE	MIDDLE
	35	PATIENT NO.	YES	YES	YES	YES	YES	YES
	36	SET PATIENT NO.	0001	0001	0001	0001	0001	0001
	37	NAME PRINT	YES	YES	YES	YES	YES	YES
	38	DATE FORMAT	Y / M / D	M / D / Y	M / D / Y	M / D / Y	M / D / Y	M / D / Y
	39	PRINT COMMENT	YES	YES	YES	YES	YES	YES
PRINT2	41	AR PRINT	ALL	ALL	ALL	ALL	ALL	ALL
	43	CONF.INDEX	YES	YES	YES	YES	YES	YES
	44	ERROR DATA	YES	YES	YES	YES	YES	YES
	45	CAT MARK	NO	NO	NO	NO	NO	NO
	46	ERROR PRINT	NO	NO	NO	NO	NO	NO
PRINT3	51	SE PRINT	NO	NO	NO	NO	NO	NO
	52	EYE PRINT	NO	NO	NO	NO	NO	NO
	53	TL PRINT	NO	NO	NO	NO	NO	NO
	54	CL PRINT	NO	NO	NO	NO	NO	NO
	55	NEAR PD PRINT	NO	NO	NO	NO	NO	NO
	56	WORKING D.	40cm	40cm	40cm	40cm	16inch	40cm
FUNCTION	61	WINDOW CHECK	NO	NO	NO	NO	NO	NO
	62	TRACKING SW	TRC / ASHOT	TRC / ASHOT	TRC / ASHOT	TRC / ASHOT	TRC / ASHOT	TRC / ASHOT
	63	AUTO PD	YES	YES	YES	YES	YES	YES
	64	SLEEP	5min	5min	5min	5min	5min	5min
	65	BEEP	Low	Low	Low	Low	Low	Low
	66	LCD BRIGHTNESS	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL
	67	ICON OFF	NO	NO	NO	NO	NO	NO
	68	ALIGN QUALITY	FINE	FINE	FINE	FINE	FINE	FINE
	69	MAN DISP FOCUS	YES	YES	YES	YES	YES	YES
COMMUNICATION	71	I/F MODE	NIDEK	NIDEK	NIDEK	NIDEK	NIDEK	NIDEK
	72	I/F FORMAT	SHORT	SHORT	SHORT	SHORT	SHORT	SHORT
	73	BAUD-RATE	9600	9600	9600	9600	9600	9600
	74	BIT LENGTH	8	8	8	8	8	8
	75	CR CODE	NO	NO	NO	NO	NO	NO
	76	LM DATA PRINT	NO	NO	NO	NO	NO	NO
CLOCK SET	CLOCK MODE		24h	24h	24h	24h	AM / PM	24h
COMMENT SET	COMMENT SET		NIDEK ARK-310A / NIDEK ARK-330A					
—	CYL MODE		±	-	-	-	-	-
	AUTO SHOT		ON	ON	ON	ON	ON	ON
	AUTO TRACKING (AR-330A)		3D	3D	3D	3D	3D	3D
	AUTO TRACKING (AR-310A)		UP/DOWN	UP/DOWN	UP/DOWN	UP/DOWN	UP/DOWN	UP/DOWN

8.6.2 ARK-510A/ARK-530A

Parameter item	No.	Item	JAPAN	FOREIGN	VON HOFF	OCULUS	INC	CHINA
AR	1	STEP	0.25D	0.25D	0.25D	0.25D	0.25D	0.25D
	2	VERTEX D.	12.00mm	12.00mm	12.00mm	12.00mm	13.75mm	12.00mm
	3	AXIS STEP	1°	1°	1°	1°	1°	1°
	4	MEAS MODE	Con.	Con.	Con.	Con.	Con.	Con.
	5	AI MODE	YES	YES	YES	YES	YES	YES
	6	AR CONTINUE	3	3	3	3	3	3
	7	AR THUMBNAIL	YES	YES	YES	YES	YES	YES
KM	11	KM UNIT	mm	mm	mm	mm	D	mm
	12	KM DISPLAY	R1、R2	R1、R2	R1、R2	R1、R2	R1、R2	R1、R2
	13	REF. INDEX	1.3375	1.3375	1.3375	1.3375	1.3375	1.3375
	14	KM CONTINUE	3	3	3	3	3	3
	15	PERIPHERAL	NO	NO	NO	NO	NO	NO
COMPARE	21	COMPARE SW	Manu.	Manu.	Manu.	Manu.	Manu.	Manu.
	22	COMPARE(AR)	SE	SE	SE	SE	SE	SE
	23	ADD SW	YES	YES	YES	YES	YES	YES
	24	ADD SELECT	1.75D	1.75D	1.75D	1.75D	1.75D	1.75D
PRINT1	31	PRINT	Manu.	Manu.	Manu.	Manu.	Manu.	Manu.
	32	ECONO. PRINT	NO	NO	NO	NO	NO	NO
	33	PRINT&CLEAR	NO	NO	NO	NO	NO	NO
	34	PRINT DENCITY	MIDDLE	MIDDLE	MIDDLE	MIDDLE	MIDDLE	MIDDLE
	35	PATIENT NO.	YES	YES	YES	YES	YES	YES
	36	SET PATIENT NO.	0001	0001	0001	0001	0001	0001
	37	NAME PRINT	YES	YES	YES	YES	YES	YES
	38	DATE FORMAT	Y／M／D	M / D / Y	M / D / Y	M / D / Y	M / D / Y	M / D / Y
	39	PRINT COMMENT	YES	YES	YES	YES	YES	YES
PRINT2	41	AR PRINT	ALL	ALL	ALL	ALL	ALL	ALL
	42	KM PRINT	SHORT	SHORT	SHORT	SHORT	SHORT	SHORT
	43	CONF.INDEX	YES	YES	YES	YES	YES	YES
	44	ERROR DATA	YES	YES	YES	YES	YES	YES
	45	CAT MARK	NO	NO	NO	NO	NO	NO
	46	ERROR PRINT	NO	NO	NO	NO	NO	NO
	47	PRINT FORMAT	R -> L	R -> L	R -> L	R -> L	R -> L	R -> L
PRINT3	51	SE PRINT	NO	NO	NO	NO	NO	NO
	52	EYE PRINT	NO	NO	NO	NO	NO	NO
	53	TL PRINT	NO	NO	NO	NO	NO	NO
	54	CL PRINT	AUTO	NO	NO	NO	NO	NO
	55	NEAR PD PRINT	NO	NO	NO	NO	NO	NO
	56	WORKING D.	40cm	40cm	40cm	40cm	16inch	40cm
FUNCTION	61	WINDOW CHECK	NO	NO	NO	NO	NO	NO
	62	TRACKING SW	TRC/ASHOT	TRC/ASHOT	TRC/ASHOT	TRC/ASHOT	TRC/ASHOT	TRC/ASHOT
	63	AUTO PD	YES	YES	YES	YES	YES	YES
	64	SLEEP	5min	5min	5min	5min	5min	5min
	65	BEEP	Low	Low	Low	Low	Low	Low
	66	LCD BRIGHTNESS	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL
	67	ICON OFF	NO	NO	NO	NO	NO	NO
	68	ALIGN QUALITY	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL
	69	MAN DISP FOCUS	YES	YES	YES	YES	YES	YES
COMMUNICATION	71	I/F MODE	NIDEK	NIDEK	NIDEK	NIDEK	NIDEK	NIDEK
	72	I/F FORMAT	SHORT	SHORT	SHORT	SHORT	SHORT	SHORT
	73	BAUD-RATE	9600	9600	9600	9600	9600	9600
	74	BIT LENGTH	8	8	8	8	8	8
	75	CR CODE	NO	NO	NO	NO	NO	NO
	76	LM DATA PRINT	NO	NO	NO	NO	NO	NO
SAGITTAL	81	SAGITTAL	None	YES	YES	YES	YES	YES
	82	SAGIT AXIS	None	AXIS	AXIS	FIX	AXIS	AXIS
	83	SAGIT PRINT	None	ALL	ALL	ALL	ALL	ALL
CLOCK SET		CLOCK MODE	24h	24h	24h	24h	AM／PM	24h
COMMENT SET		COMMENT SET	NIDEK ARK-510A / NIDEK ARK-530A					
CL LIST SET		CL LIST SET	----------	None	None	None	None	None
—		CYL MODE	±	–	–	–	–	–
		AUTO SHOT	ON	ON	ON	ON	ON	ON
		AUTO TRACKING(ARK-530A)	3D	3D	3D	3D	3D	3D
		AUTO TRACKING(ARK-510A)	UP/DOWN	UP/DOWN	UP/DOWN	UP/DOWN	UP/DOWN	UP/DOWN
		MEAS MODE	ARK	ARK	ARK	ARK	ARK	ARK
		CL SELECT	OFF	None	None	None	None	None

8.6.3 AR-360A

Parameter item	No.	Item	FOREIGN	INC	CHINA
AR	1	STEP	0.25D	0.25D	0.25D
	2	VERTEX D.	12.00mm	13.75mm	12.00mm
	3	AXIS STEP	1°	1°	1°
	4	MEAS MODE	Con.	Con.	Con.
	5	AI MODE	YES	YES	YES
	6	AR CONTINUE	3	3	3
	7	AR THUMBNAIL	YES	YES	YES
PRINT1	31	PRINT	Manu.	Manu.	Manu.
	32	ECONO. PRINT	NO	NO	NO
	33	PRINT&CLEAR	NO	NO	NO
	34	PRINT DENCITY	MIDDLE	MIDDLE	MIDDLE
	35	PATIENT NO.	YES	YES	YES
	36	SET PATIENT NO.	0001	0001	0001
	37	NAME PRINT	YES	YES	YES
	38	DATE FORMAT	M / D / Y	M / D / Y	M / D / Y
	39	PRINT COMMENT	YES	YES	YES
PRINT2	41	AR PRINT	ALL	ALL	ALL
	42	KM PRINT	SHORT	SHORT	SHORT
	43	CONF.INDEX	YES	YES	YES
	44	ERROR DATA	YES	YES	YES
	45	CAT MARK	NO	NO	NO
	46	ERROR PRINT	NO	NO	NO
	47	PRINT FORMAT	OBJ->SBJ	OBJ->SBJ	OBJ->SBJ
PRINT3	51	SE PRINT	NO	NO	NO
	52	EYE PRINT	NO	NO	NO
	53	TL PRINT	NO	NO	NO
	54	CL PRINT	NO	NO	NO
	55	NEAR PD PRINT	NO	NO	NO
	56	WORKING D.	40cm	16inch	40cm
FUNCTION	61	WINDOW CHECK	NO	NO	NO
	62	TRACKING SW	TRC/ASHOT	TRC/ASHOT	TRC/ASHOT
	63	AUTO PD	YES	YES	YES
	64	SLEEP	5min	5min	5min
	65	BEEP	Low	Low	Low
	66	LCD BRIGHTNESS	NORMAL	NORMAL	NORMAL
	67	ICON OFF	NO	NO	NO
	68	ALIGN QUALITY	NORMAL	NORMAL	NORMAL
	69	MAN DISP FOCUS	YES	YES	YES
COMMUNICATION	71	I/F MODE	NIDEK	NIDEK	NIDEK
	72	I/F FORMAT	SHORT	SHORT	SHORT
	73	BAUD-RATE	9600	9600	9600
	74	BIT LENGTH	8	8	8
	75	CR CODE	NO	NO	NO
	76	LM DATA PRINT	NO	NO	NO
SUBJECT	91	AUTO SUBJECT	NO	NO	NO
	92	SUBJECT CHART	0.8	25	0.8
	93	NEAR CHART	0.63	30	0.63
	94	VA DISPLAY	DEC	FRAC	DEC
CLOCK SET	CLOCK MODE		24h	AM／PM	24h
COMMENT SET	COMMENT SET		NIDEK AR-360A		
	CL LIST SET		None	None	None
—	CYL MODE		—	—	—
	AUTO SHOT		ON	ON	ON
	AUTO TRACKING(ARK-360A)		3D	3D	3D

8.6.4 ARK-560A

Parameter item	No.	Item	FOREIGN	INC	CHINA
AR	1	STEP	0.25D	0.25D	0.25D
	2	VERTEX D.	12.00mm	13.75mm	12.00mm
	3	AXIS STEP	1°	1°	1°
	4	MEAS MODE	Con.	Con.	Con.
	5	AI MODE	YES	YES	YES
	6	AR CONTINUE	3	3	3
	7	AR THUMBNAIL	YES	YES	YES
KM	11	KM UNIT	mm	D	mm
	12	KM DISPLAY	R1、R2	R1、R2	R1、R2
	13	REF. INDEX	1.3375	1.3375	1.3375
	14	KM CONTINUE	3	3	3
	15	PERIPHERAL	NO	NO	NO
PRINT1	31	PRINT	Manu.	Manu.	Manu.
	32	ECONO. PRINT	NO	NO	NO
	33	PRINT&CLEAR	NO	NO	NO
	34	PRINT DENCITY	MIDDLE	MIDDLE	MIDDLE
	35	PATIENT NO.	YES	YES	YES
	36	SET PATIENT NO.	0001	0001	0001
	37	NAME PRINT	YES	YES	YES
	38	DATE FORMAT	M / D / Y	M / D / Y	M / D / Y
	39	PRINT COMMENT	YES	YES	YES
PRINT2	41	AR PRINT	ALL	ALL	ALL
	42	KM PRINT	SHORT	SHORT	SHORT
	43	CONF.INDEX	YES	YES	YES
	44	ERROR DATA	YES	YES	YES
	45	CAT MARK	NO	NO	NO
	46	ERROR PRINT	NO	NO	NO
	47	PRINT FORMAT	AR->KM	AR->KM	AR->KM
PRINT3	51	SE PRINT	NO	NO	NO
	52	EYE PRINT	NO	NO	NO
	53	TL PRINT	NO	NO	NO
	54	CL PRINT	NO	NO	NO
	55	NEAR PD PRINT	NO	NO	NO
	56	WORKING D.	40cm	16inch	40cm
FUNCTION	61	WINDOW CHECK	NO	NO	NO
	62	TRACKING SW	TRC/ASHOT	TRC/ASHOT	TRC/ASHOT
	63	AUTO PD	YES	YES	YES
	64	SLEEP	5min	5min	5min
	65	BEEP	Low	Low	Low
	66	LCD BRIGHTNESS	NORMAL	NORMAL	NORMAL
	67	ICON OFF	NO	NO	NO
	68	ALIGN QUALITY	NORMAL	NORMAL	NORMAL
	69	MAN DISP FOCUS	YES	YES	YES
COMMUNICATION	71	I/F MODE	NIDEK	NIDEK	NIDEK
	72	I/F FORMAT	SHORT	SHORT	SHORT
	73	BAUD-RATE	9600	9600	9600
	74	BIT LENGTH	8	8	8
	75	CR CODE	NO	NO	NO
	76	LM DATA PRINT	NO	NO	NO
SAGITTAL	81	SAGITTAL	YES	YES	YES
	82	SAGIT AXIS	AXIS	AXIS	AXIS
	83	SAGIT PRINT	ALL	ALL	ALL
SUBJECT	91	AUTO SUBJECT	NO	NO	NO
	92	SUBJECT CHART	0.8	25	0.8
	93	NEAR CHART	0.63	30	0.83
	94	VA DISPLAY	DEC	FRAC	DEC
CLOCK SET	CLOCK MODE		24h	AM／PM	24h
COMMENT SET	COMMENT SET		NIDEK ARK-560A		
CL LIST SET	CL LIST SET		None	None	None
—	CYL MODE		—	—	—
	AUTO SHOT		ON	ON	ON
	AUTO TRACKING(ARK-560A)		3D	3D	3D
	MEAS MODE		ARK	ARK	ARK
	CL SELECT		None	None	None

8.7 Jig List

Part No.	Name	Part No.	Name	Part No.	Name
30670-0000	AR17DJ-1set	30670-0100	High-power spherical model eye		
		30670-0200	Small pupil model eye		
		30670-0300	KM calibration jig		
		30670-1000	Optical adjustment jig set	30670-1100	Joint jig
				30670-1200	Reticle illumination jig
				30670-1300	Reticle observation jig
				30670-1400	Camera jig
				30670-1500	Ring lens illumination jig
				30670-1600	Diffuser
				30670-1800	Chart lens P
				30670-1900	Chart lens M
				30670-M029	Reflector plate
				30670-M031	Holder
				32177-0618	0D model eye 2
				99104-G020	Dioptric tester
		30670-5200	International service calibration jig	32171-0600	22-model eye jig
				32107-1100	Chinrest attachment jig
				32171-1200	Service model eye
				32177-1400	Aspheric model eye jig
				32177-1500	Cylinder axis adjustment jig
				32107-6300	Attachment jig for service model eye
		30670-5300	Service optical adjustment jig	32177-0618	0D model eye 2
				30670-1100	Joint jig
				30670-1200	Reticle illumination jig
				30670-BA01	Relay board
				30670-E001	Flexible flat cable
				30670-EA06	Relay cable 3
				32557-EA11	EA39 extension cable
		30601-E030	USB memory		
		30670-EA01	Relay cable ASSY.	30670-BA01	Relay board
				30670-E001	Flexible flat cable
				30670-EA04	Relay cable 1
				30670-EA05	Relay cable 2
30670-0600	Dioptric tester jig ASSY.	30670-2300	Chart inspection jig		

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